

**WILD ANIMALS IN
TRAVELLING
CIRCUSES**

**THE REPORT OF THE CHAIRMAN OF THE
CIRCUS WORKING GROUP**

OCTOBER 2007

"We know so little about the physiology and the sentience of the exotic species that often used to be seen - and still are - in some travelling circuses."

Lord Soulsby of Swaffham Prior FRCVS

**Debate on the Animal Welfare
Bill in Grand Committee,
House of Lords,
23 May 2006**

CHAIRMAN'S FOREWORD

I would like to make four important points at the outset of this Report.

First, I am conscious that, to varying degrees, all the members of the Circus Working Group have had serious reservations about participating in the process we have undertaken. This was perhaps inevitable in bringing together two groups of people with diametrically opposed views about the continued use of non-domesticated animals in circuses. Those from the industry clearly wish to see their traditional livelihood secured and protected, while all the welfare organisations involved have long campaigned for a total ban on the use of non-domesticated animals in circuses. It is not surprising if the industry regarded the process with suspicion and not a little fear, while the welfare organisations were concerned that the Working Group was a mechanism to frustrate their ultimate objective. There have been a number of occasions when it seemed that the process might fail altogether. Most, if not all, of the participants have been on the point of walking away at least once, and I think it is some achievement to have completed our work with only a single refusal to participate and one resignation during the process. An exercise of this nature cannot please everyone - possibly the outcome will please no one - but however the various participants view the conclusion, I hope they feel that their views have been treated seriously, objectively, and with due respect. Against this background, I would like to take this opportunity to pay tribute to all the members of the Working Group for their time, their effort, and the professional manner in which they have advanced their respective arguments.

Second, I wish to emphasise that the primary purpose of the exercise has been to subject scientific evidence submitted by each side of the controversy to independent expert review better to inform Ministers and the wider debate about the use of non-domesticated animals in circuses. Although I have explored various issues separately with each side, the Working Group was not intended to be a negotiating forum. Neither side has been asked to compromise its principles during our work, and neither has done so. Furthermore, involvement with the Working Group has not prevented either side from continuing to campaign for its particular viewpoint.

Third, it must be understood that this is the Chairman's Report, not that of the Working Group. With the exception of Chapter 5, which is the work of the Academic Panel, this Report represents my personal analysis and conclusions. The members of the Circus Working Group have not been party to the compilation of the Report, and I have not sought their views or agreement prior to its publication. Indeed, the final Report was delivered to Ministers before its contents were presented to the Working Group. It follows that none of the members of the Working Group – neither as individuals nor on behalf of the organizations they represent – should be taken to have endorsed the Report's contents or to be a party to them.

Fourth, the contribution of the Academic Panel has been invaluable and much appreciated. The distinguished and learned nominees who served on the Panel not only undertook a complex and onerous task, but the credibility of the entire exercise

has been wholly dependent on their individual and collective analysis of the available evidence and also their personal expertise, reputation and standing.

Finally, I would like to take this opportunity to thank all those who have contributed to the activities of the Circus Working Party: the members of the Group itself; the members of the Academic Panel, especially its Chairman, Mike Lomas, whose efforts succeeded in producing a unanimous view of the evidence; Laura John, who was responsible for the administration associated with establishing the Working Group; Hugh Togher and Charlotte Coles, for administrative and technical support; and Jennifer Anderson, for undertaking documentary research. In particular, however, I would like to express my gratitude to Helen Odom whose intellect, initiative, organisational skills, and good humour combined to make an indispensable contribution to the activities of the Working Group and the contents of this Report.

MIKE RADFORD
Aberdeen, October 2007

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1. EXECUTIVE SUMMARY

- The number of non-domesticated animals used in circuses in the United Kingdom is less than 50, but the issue generates strongly held opinions on both sides of the debate and a considerable degree of public and political interest. In addition, there is potentially an international dimension to the issue as the scope and number of non-domesticated animals used in circuses throughout continental Europe is much greater than is the case in this country.
- The Academic Panel considered that, in order to justify a change to the status quo, the balance of the evidence would have to present a convincing and coherent argument for change. On the basis of the scientific evidence submitted to it, the Panel concluded that such an argument had not been made out.
- The Academic Panel concluded that there appears to be little evidence to demonstrate that the welfare of animals kept in travelling circuses is any better or worse than that of animals kept in other captive environments.
- It is concluded that in relation to England, Wales, and Scotland, the consequence of the Academic Panel's Report is that Ministers do not have before them scientific evidence sufficient to demonstrate that travelling circuses are not compatible with meeting the welfare needs of any type of non-domesticated animal presently being used in the United Kingdom. It is further submitted that such a decision must be based on scientific evidence, and other considerations are extraneous, and therefore unlawful in the context of section 12. Furthermore, in the absence of compelling scientific evidence, any attempt to ban the use of an animal would fall foul of the principle of proportionality. Accordingly, it is proposed that further primary legislation would be required to have any realistic prospect of achieving a lawful ban.

- The status quo is not a tenable option.
- It is submitted that if a partial or complete ban on the use of non-domesticated animals used in travelling circuses is to be introduced, it would have to be done by means of primary legislation.
- The circus industry has indicated that it is receptive to the principle of regulation but, to be credible, any such regulation must not only ensure high standards of welfare for the animals, it must also result in a significant degree of transparency and accountability if it is to win over public confidence.
- Regulation could be introduced under the authority of section 13 of the Animal Welfare Act using the Zoo Licensing Act as a model.
- If the use of any non-domesticated animals is to remain lawful, the issue of blanket bans by local authorities on the use of their land requires further consideration.
- The overriding conclusion of this exercise is that our present state of knowledge about the welfare of non-domesticated animals used in circuses is such that we cannot look to scientific evidence for a steer in the development of policy; it is, ultimately, an entirely political decision. Once the relevant policy is decided upon, its implementation is essentially a question of politics and law; science, on this occasion, provides no relevant guidance as to the appropriate principle to be adopted.

2. BACKGROUND

2.1 THE MINISTERIAL STATEMENT OF 8TH MARCH 2006

- 2.1.1. A week before Report and Third Reading of the Animal Welfare Bill in the House of Commons, the Parliamentary Under-Secretary of State for Environment, Food and Rural Affairs, Ben Bradshaw MP, made the following Written Statement relating to circuses:

I have previously made it clear that I sympathise with the view that performances by some wild animals in travelling circuses are not compatible with meeting their welfare needs. The Animal Welfare Bill will itself represent a significant step forward: Clause 8 [now Section 9] imposes a requirement that someone responsible for an animal, such as a circus proprietor, should meet its reasonable welfare needs.

But having listened carefully to the arguments of hon. Members of this House at Second Reading and during Standing Committee I am not convinced that by itself this element of the Animal Welfare Bill will provide sufficient clarity to circus proprietors and enforcers on what is permitted and what is not. To provide this clarity I intend to use a regulation under clause 10 of the Animal Welfare Bill [now section 12 of the Act] to ban the use in travelling circuses of certain non-domesticated species whose welfare needs cannot be satisfactorily met in that environment. In drawing up proposals for secondary legislation we intend to ensure a clear read-across between zoo licensing standards and those standards that we will require from permanent circus premises. Individuals or organisations who train performing animals will be subject to inspection. This will be in addition to existing proposals that we introduce a code of practice for circuses and performing animals to deal with other issues such as training activities, trainer competences and accommodation needs for animals when travelling.

The ban will apply to travelling circuses only—zoo performances, performances in the audio-visual industry and performances in static circuses will not be affected. Discussions will start shortly with industry, welfare organisations and other Government Departments on the content of draft regulations, which will then go to public consultation.¹

2.2. THE REMIT OF THE CIRCUS WORKING GROUP

- 2.2.1. The Circus Working Group was subsequently established in June 2006 with a remit derived directly from this statement. In its initial letter advising representatives of interested parties of the establishment of the Working Group

1 8 March 2006, col 60WS.

and inviting them to participate in its work, Defra wrote:

Mr Bradshaw's written statement to the House of Commons on 8 March 2006 explained that we intend to introduce a ban, using a regulation made under clause 12 of the Animal Welfare Bill, on the use of certain non-domesticated species in travelling circuses. This is on the basis that we accept that the welfare needs of certain non-domesticated species cannot be readily met in a travelling circus environment....

The remit of the group is to provide, and consider, evidence relating to the transportation and housing needs of non-domesticated species. It will look at the possibility of a read across between the welfare standards for non-domesticated animals being kept in zoos with those being used in travelling circuses. Training will not be included in the remit as it is being considered as part of the wider Defra review of the regulation of animals used in performance.

For the purposes of this working group, a non-domesticated animal is a member of a species that is not normally domesticated in the British Islands; that is to say, a species whose collective behaviour, life cycle or physiology remains unaltered from the wild type despite their breeding and living conditions being under human control for multiple generations....

2.2.2. The letter further indicated that the members of the Working Group would be asked to provide evidence and, on the basis of this evidence, "to consider, which, if any, non-domesticated species are suitable for use in travelling circuses". The scope of the evidence was to include material relating to:

- welfare during transportation;
- accommodation standards;
- behavioural needs, and whether these can be met in a travelling circus environment;
- the future of those animals deemed unsuitable for a circus environment, but already represented in circuses;
- the percentage of time that animals are on tour with travelling circuses and the extent to which they may also be travelling and in temporary accommodation for use in media other than circuses;
- the ability of the industry to meet the cost of higher welfare standards.

2.2.3. The Department also indicated that it would look to the Working Group to offer advice on how to define the term 'travelling circuses'. The letter indicated that, in order to distinguish these from zoos and audio-visual performances, it was intended to define 'travelling circus' in terms of the length of time the animals spend away from their permanent premises and the Working Group was asked for its views on what this length of time ought to be.²

2 Defra, Invitation Letter, 13 June 2006.

2.2.4. It will be noted from the above that issues relating to the training and performance of non-domesticated circus animals were expressly omitted from the Working Group's terms of reference as these matters are currently being considered by a separate working group concerned with the training and performance of animals generally. While one can understand that any duplication of effort would be undesirable and there is a logic in looking at the subject of training and performance in the round and in all its various contexts, it is nevertheless the case that in consequence the remit of the Circus Working Group and, accordingly, the focus of this Report is concerned only with two of the four factors which impact on the welfare of non-domesticated animals used in circuses, namely transportation and housing. One can only speculate whether the substance of this Report would have been materially different if the Working Group had looked at the full picture.

2.3. MEMBERSHIP OF THE WORKING GROUP

2.3.1. The membership of the Circus Working Group consisted of the following:

Chairman

Mike Radford (Reader in Law, University of Aberdeen)

Chairman of the Academic Panel

Mike Lomas (formerly Deputy Head of Animal Welfare Veterinary Division, Defra)

Industry Sub-Group

Chris Barltrop	Equity
Malcolm Clay	Association of Circus Proprietors of Great Britain
Peter Jolly Jr	Jollys' Circus
Peter Jolly Sr	Jollys' Circus
Carol MacManus	Circus Mondao
Arie Oudenes	European Circus Association
Laura Van Der Meer	European Circus Association
Moira Roberts	Bobby Robert's Super Circus
Albert Tyler-Moore	The Great British Circus

Welfare Organisations Sub-Group

Rob Atkinson	RSPCA
Ros Clubb	RSPCA
Helder Constantino	Animal Defenders International
Jan Creamer	Animal Defenders International
Chris Draper	Born Free Foundation

Mike Flynn	Scottish SPCA
Sasha Foreman	RSPCA
Tim Phillips	Animal Defenders International
Will Travers	Born Free Foundation
Daniel Turner	Born Free Foundation

Secretariat

Helen Odom	Animal Welfare Act Team, Defra
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- 2.3.2. Representatives of a number of other interested organisations were kept informed of the Working Group's activities as were officials of Defra; the Department for Culture, Media, and Sport; the Arts Council of England; the Scottish Government; and the Welsh Assembly Government.
- 2.3.3. Administrative support was provided by Defra, but the Working Group has at all times acted independently of the Department.

2.4. HOW THE WORKING GROUP FUNCTIONED

- 2.4.1. The phrase 'Working Group' is somewhat misleading, as it suggests a body which works together towards a common end. In this case, however, the nature of the exercise was to engage with those representing both sides of the debate, and to ask them to submit such evidence as they considered relevant for review by an independent expert panel.
- 2.4.2. Defra contacted appropriate organisations in June 2006, inviting them to participate in the Circus Working Group. Of those, only the Captive Animals Protection Society declined to take part.
- 2.4.3. The Chairman of the Working Group and the Chairman of the Academic Panel were both appointed by Defra.
- 2.4.4. The first meeting of the Group was held on 10 July 2006 at which it was agreed that the nature of the task and the respective positions of the two sides necessitated the formation of two sub-groups, one made up of the representatives from the industry, the other comprising representatives from the welfare organisations.
- 2.4.5. Formal meetings were held with each Sub-Group on three occasions. In addition, there were regular informal contacts between the Chairman and the members of the two Sub-Groups; the Chairman also made a two-day visit to The Great British Circus on 10 and 11 June, 2007.
- 2.4.6. In order to carry out its remit, the Working Group was required to identify for submission to an Academic Panel all relevant evidence which might assist in our understanding of the effects of transport and housing on the welfare of non-domesticated circus animals. This was achieved by the Industry Sub-

Group and the Welfare Organisations Sub-Group working independently of each other to draw up their respective submissions and supporting evidence. In addition, although beyond a strict view of our remit, it became clear that, to be useful, this Report would have to include some consideration of relevant regulatory issues, and both Sub-Groups were therefore invited to submit a paper on this topic.

2.4.7. The Sub-Groups were therefore asked to perform four functions:

1. To identify and submit evidence which their respective members considered relevant to the Working Group's remit.
2. To nominate individuals with the appropriate degree of scientific knowledge, expertise and experience to act as members of the Academic Panel.
3. To submit their views on regulatory issues arising from the Working Group's remit.
4. To provide further explanation and background information about the use of non-domesticated animals in circuses from their particular perspective.

3. THE SIGNIFICANCE OF THE ISSUE

- 3.1. According to the information provided by the Industry Sub-Group, there are only four British circuses currently using non-domesticated animals. At present, a total of no more than 47 animals are involved:³

The Great British Circus	1 Kangaroo 2 Llamas 4 Reindeer 5 Lions 7 Tigers 7 Camels 1 Zebra
Bobby Robert's Super Circus	1 Elephant (touring, but retired from performance) 1 camel
Circus Mondao	3 Zebras 2 Llamas and acquiring 2 Camels
Jollys' Circus	2 crocodiles 1 Zebra 1 Ankole 1 Llama 6 Snakes

- 3.2. We are concerned, then, with only a handful of animals. However, the significance of this issue cannot be measured only by reference to the number of animals involved. For the use of non-domesticated animals in circuses generates deeply held but entirely divergent views: those who use such animals in circuses consider that they are doing nothing wrong, are caring for their animals to a high standard, and should be allowed to continue to make a living by this traditional, and hitherto entirely legal, means; whereas their opponents believe the use of non-domesticated animals is morally unacceptable, their welfare inevitably poor, and regard the relatively few animals still being used in this way in the United Kingdom to be a measure of their success in campaigning against circuses.

- 3.3. It is claimed by the welfare organisations that a majority of the population are opposed to the use of non-domesticated animals in circuses. While it may be countered that opinion polls can be used to demonstrate anything, it is

3 The precise number of animals involved is entirely dependent on the definition to be attached to the term 'non-domesticated animals'.

undoubtedly the case that there exists a influential body of opinion which wishes to see an end to non-domesticated animals in circuses. Moreover, the issue is of some political significance: members of both Houses of Parliament took a keen interest in it during the passage of the Animal Welfare Bill and of those who expressed a view, the vast majority were against the practice.

- 3.4. In addition, there is a wider, international dimension to the debate. In many European countries the tradition of the travelling circus remain strong, and both the number and the range of animals involved is significantly greater than in the United Kingdom. The European Circus Association has provided what it describes as 'an indicative list' of domesticated and non-domesticated animals featured in circuses in Europe, which is reproduced below. Those most commonly used are indicated by an asterisk.

Mammals

Elephant* African/Asian
Sea Lion*
Alpaca
Snow Leopard
Antelope
Tapir
Baboon
Tiger*
Bison
Water Buffalo
Black Bear
Wolf
Bovine animal*
Zebra*
Camel*
Zebu
Cat (several races)
Chimpanzee
Dog (several races)
Donkey
Dromedary*
Eland
European brown bear
Fox
Giraffe
Goat*
Guanaco*
Hippopotamus
Horse (several types)*
Hyena
Jaguar
Kangaroo
Leopard
Liger
Lion*

Llama*
Mule
Panther
Pig*
Pony*
Puma*
Pygmy Hippopotamus
Reindeer
Rhesus Monkey
Rhinoceros

Birds

Canary
Emu
Ostrich
Parakeet
Parrot (several types such as macaw)
Penguin
Pigeon*
Vulture

Reptiles

Alligator
Snakes (several types including Indian Python and African Python)*

- 3.5. Those who wish to see an end to the use of such animals in circuses campaign in many other European countries, and the industry seeks to protect its position throughout the continent. Consequently, although the number of animals presently being used in the United Kingdom is very small, the contents of this Report, and the way in which the Government decides to respond to it, will be keenly watched not only in the UK but also throughout the rest of Europe.

4. CONSIDERATION OF THE EVIDENCE

4.1. THE NATURE OF THE EVIDENCE TO BE CONSIDERED

- 4.1.1. The Minister of State, Lord Rooker, explained to the House of Lords the nature of the evidence that the Government would take into account in developing its policy:

When deciding whether types of wild animals are suitable for performance in travelling circuses, decisions will need to be anchored in what the available scientific evidence tells us, but we recognise the need to listen to those with experience of wild animals in circuses. That obviously includes those in the industry, as well as welfare organisations and people who have gained evidence and experience from direct observation. Just because they are not commercially involved in running a circus does not mean to say that they do not have a view that is worth taking into account....

The Government are willing to consider any evidence that has a sound scientific base, preferably peer-reviewed and conducted in an environment where the animals were performing and travelling. We acknowledge that there is likely to be a lack of scientific evidence related to animals used specifically in entertainment, and we would be willing to consider sound scientific results obtained on species kept in different conditions, if we can establish that those results could reasonably be extrapolated to other circumstances. We do not consider photographic or video evidence to be sufficient to base policy decisions on. Such evidence can be open to misinterpretation and gives only a snapshot in time. A film showing a lion pacing up and down may indicate evidence of stereotypical behaviour, but equally the film may have been shot when the lion had seen its keeper approaching with food. So the context in which the film was made is important and the evidence has to go wider.

On evidence of particular instances of cruelty, while that is distressing, it is of course not sufficient to demonstrate that a particular environment necessarily causes animal suffering. Animals in any environment may be subject to particular instances of cruelty—private pet ownership is the most common example, even though one assumes that animals are safe and well looked after in those circumstances. In order to establish that a certain environment inevitably causes suffering or distress to an animal, supporting scientific evidence set out in published papers that have been peer reviewed would have to be submitted. The point here is that it must be demonstrated that animals suffer and are in distress simply by being in a certain environment, and that is why it is not something that can be proved with a snapshot.⁴

- 4.1.2. This statement provided the basis for defining the scope and character of the

4 23 May 2006, Col GC176-7.

evidence which would be considered during this exercise. The two Sub-Groups were invited to submit a paper outlining their case, together with citations of the evidence they sought to rely upon. At a meeting between the Chairman of the Working Group and the Chairman of the Academic Panel held on 4th December 2006, consideration was given to these submissions before they were sent to the other Sub-Group for its comments. These were restricted to issues of fact, accuracy, and interpretation. The respective submissions and the comments on them were considered further by the Chairman of the Working Group and the Chairman of the Academic Panel on 24th January 2007 before they were forwarded to the Academic Panel.

- 4.1.3. In drawing up the body of evidence, four issues arose. First, whether all the evidence had to be of a scientific nature; second, whether it had to be peer-reviewed; third, whether any photographs or video material was to be permitted; and, finally, the relevance of court proceedings and the accompanying evidence. Although these issues required considerable time and diplomacy, the only one which could not be resolved informally was that relating to court proceedings. The Welfare Organisations Sub-Group sought to submit a significant volume of material, including video evidence, which had been used in the successful prosecution for cruelty of Mary Chipperfield and Roger Crawley. The Chairman of the Working Group and the Chairman of the Academic Panel agreed that this fell outside the conditions laid down by the Minister, and the material was not put forward. Apart from this, everything of a scientific nature which the Sub-Groups submitted was considered by the Academic Panel.

4.2. APPOINTMENT OF THE ACADEMIC PANEL

- 4.2.1. The Chairman of the Academic Panel was Mike Lomas, a veterinarian with considerable experience and formerly Deputy Head of Animal Welfare Veterinary Division at Defra.
- 4.2.2. The other members of the Panel were appointed by Defra, having been nominated by the Sub-Groups: the Industry Sub-Group made three nominations, as did the Welfare Organisations Sub-Group. All the nominations were accepted and appointed. Each member of the Academic Panel acted as an independent expert; their role was not to promote the interests of the Sub-Group which had nominated them. None of the members of the Academic Panel was paid or otherwise rewarded for their services by the organisations which nominated them.

4.3. MEMBERS OF THE ACADEMIC PANEL

- 4.3.1. The Members of the Academic Panel were:

Mike Lomas BVSc MRCVS JP (Chairman)

Professor Sir Patrick Bateson MA PhD ScD FRS

Professor of Ethology, University of Cambridge, UK

Professor Ted Friend PhD

Department of Animal Science, Texas A&M University, United States

Dr Marthe Kiley-Worthington BSc DPhil MPhil

Director Centre of Eco-Etho Research and Education, Drome, France

Fellow, Berkeley, University of California

Samantha Lindley BVSc MRCVS

Veterinary Surgeon Behaviourist, United Kingdom

Professor Georgia Mason BSc PhD

Canada Research Chair in Animal Welfare

University of Guelph, Canada

Visiting Professor in Animal Welfare, Royal Veterinary College, UK

Peter Scott MSc BVSc FRCVS

RCVS Specialist in Zoo and Wildlife Medicine

Biotope Specialist Veterinary Consultancy, Winchester, UK

4.4. THE ACADEMIC PANEL'S TERMS OF REFERENCE

4.4.1. The Academic Panel received: the submissions from both Sub-Groups; each Sub-Group's comments on the other Group's submission; and all the references which were cited to support the respective submissions.

4.4.2. The members of the Academic Panel were asked:

- to assess the quality of the evidence in the submissions provided by the Welfare and Industry Sub-Groups; and
- to consider any evidence with a sound scientific basis, preferably peer-reviewed and conducted in an environment where the animals were performing and travelling, to support a ban in relation to a particular non-domesticated species.

4.4.3. A bibliography of the relevant reference is set out in the Appendix to this Report.

4.5. HOW THE ACADEMIC PANEL CARRIED OUT ITS TASK

4.5.1. The Panel did not meet; it carried out all its deliberations by email. Its work was co-ordinated by the Chairman of the Panel. The Chairman of the Working Group took no part in its work.

4.5.2. Having considered all the material which was submitted to it, the Academic Panel agreed the Report which is set out in the following chapter.

5. THE REPORT OF THE ACADEMIC PANEL

Having considered all the material which was submitted to them, the members of the Academic Panel have agreed the following Report.

5.1. INTRODUCTION

- 5.1.1. In general, the Academic Panel was disappointed with the evidence submitted by both the Welfare and Industry Sub-Groups and was divided over which Sub-Group presented the stronger argument. For the status quo to be changed the balance of evidence would have to present a convincing and coherent argument for change.
- 5.1.2. The opinion of the Academic Panel members is that such an argument, based on a sound scientific basis, has not been made.
- 5.1.3. There appears to be little evidence to demonstrate that the welfare of animals kept in travelling circuses is any better or worse than that of animals kept in other captive environments.
- 5.1.4. When seeking submissions, Defra anticipated that identifying research meeting its stated criteria might prove difficult. At the outset of the exercise, it acknowledged “that there is likely to be a lack of scientific evidence relating to animals used specifically in entertainment, and would be willing to consider sound scientific results obtained on species kept in different conditions, if it can be established that those results can reasonably be extrapolated to other circumstances.”⁵
- 5.1.5. The opinion of the Academic Panel is that the environment in circuses is too different from those of farms or zoos for helpful comparisons of research findings to be made. Legitimate comparisons could possibly be made with animals transported regularly to shows or competitions involving a high degree of training and human contact but the data are not available at present although even this could be problematic as these are usually domesticated animals.
- 5.1.6. Non-domesticated circus animals have been the subjects of research carried out by two members of the Panel as well as others. Although this research has not found evidence of adverse welfare, the Panel encourages continued monitoring and research on the welfare of circus animals.

5 Defra, Invitation Letter, 13 June 2006.

5.2. GENERAL COMMENTS ON THE EVIDENCE

- 5.2.1. Unfortunately, significant parts of the submissions, and the comments on submissions, tended to err towards being adversarial and, in the view of the Academic Panel, without any evidence being presented to support a ban.
- 5.2.2. Perhaps understandably, both submissions rely heavily on ‘cherry-picking’ the references or parts of references which support their particular case. Both submissions also interpret such evidence as there is in a way to support the case being presented. Two examples of this, stereotypic behaviour and transport, are detailed below.
- 5.2.3. The results of opinion polls were disregarded, as they do not provide evidence of suffering in circus animals.
- 5.2.4. A significant part of the Industry submission concerned regulatory issues (to be considered separately) and this was disregarded by the Panel.
- 5.2.5. Much of the background presented by the industry, although interesting, did not present credible evidence that animals in circuses do not suffer, and was disregarded. However, there have been several studies conducted on aspects of the behaviour of circus animals and those studies did not identify inherent problems with the welfare of the animals that were studied. However, some members of the Group felt that this still needs corroborating with larger samples, physiological as well as behavioural data, and a reference population for comparison.

5.3. HOUSING

- 5.3.1. Comparisons were made with zoos where some animals might be more confined than circuses whereas, in others, they might have more space.
- 5.3.2. The extra stimuli experienced by animals in circuses by way of performing, being trained, being transported, and a regularly changing environment was said to be negative by the Welfare Sub-Group and positive by the Industry Sub-Group with little supporting evidence. Although the Academic Panel has not considered evidence relating to performance and training this, nevertheless, accounts for a significant part of the time budget of animals and makes circus animals different from other animals in captivity.
- 5.3.3. It should be noted that there is an element of selection for animals in circuses. Animals that are difficult to transport or which react adversely to performance and the presence of crowds are unlikely to be retained in the circus. The Panel debated whether such selection might ‘pass on’ welfare problems but that was outside the remit of this Report.
- 5.3.4. Whilst it was accepted that animals kept in circuses were more confined than

in the wild the opinion of most of the Panel was that this did not, necessarily, lead to adverse welfare.

5.4. TRAVEL

- 5.4.1. The Welfare Sub-Group made much of transport being a cause of stress to animals and cited papers relating to the transport of farm animals. They stated that, as circus animals were transported regularly, this meant that they must be subject to more stress than animals in zoos. The Industry Sub-Group argued the opposite. All transport will cause some stress but if the conditions are good and the animals are properly trained then that stress may be minimised. Circus animals are often transported in containers/vehicles that are also 'home'; therefore the stress of a novel environment may be reduced. They infrequently appear to object to being loaded and unloaded compared to animals not used to being transported regularly, although systematic data on this have not yet been collected.
- 5.4.2. There is much made of the distance and the duration of journeys whereas it is well documented that it is the quality of the journey that is important and other factors such as poor means of transport, poor handling/driving and inappropriate feeding/watering contribute to increased stress.
- 5.4.3. The Panel concluded that, although circus animals are transported regularly, there is no evidence that this, of its own nature, causes the animals' welfare to be adversely affected.

5.5. STEREOTYPIC BEHAVIOUR

- 5.5.1. The exchanges between Panel members indicated that this is a very complex area. There appears to be no data to indicate that the presence of stereotypic behaviour proves bad welfare or that the absence of stereotypic behaviour proves that welfare is good. Where animals have been brought in to circuses, separating the stereotypic behaviour resulting from earlier experience from current experience is difficult. Some researchers concluded that a significant number of stereotypic behaviours in circus tigers and elephants are anticipatory and not indicative of poor welfare. However, others, who argue that these could still be triggered by frustration or a poor environment, contest this.
- 5.5.2. Thus the Panel concluded that it is very difficult to make a decision on welfare based on stereotypic behaviour alone.

5.6. PHYSICAL HEALTH

- 5.6.1. Although some health problems (for example, arthritis and foot problems in elephants) are reported, in general, the overall health of animals, based on some of the papers cited, in travelling circuses is reported as being good. It is

true that the state of performing animals is fully open to public view during the travelling season although some concerns have been expressed about the conditions in winter quarters.

5.6.2. The Panel concluded that there is little evidence that the health of circus animals is any better or worse than animals in other captive environments.

5.7. THE FUTURE

5.7.1. The Academic Panel believes that circus animals should continue to receive full protection under the law that can be addressed by

- the effective enforcement of existing legislation together with the provisions of the new Animal Welfare Act;
- the development of codes of practice (for example Association of Circus Proprietors and Performing Animals Welfare Standards International); and
- the revision of the Performing Animals (Registration) Act 1925 concerning the registration of trainers of performing animals.

5.7.2. It is worth emphasising the word ‘effective’ in the first bullet point. It is the view of the Panel that a significant number of statutory instruments fail, not because of inherent flaws, but because of ineffective enforcement.

5.7.3. The Panel urges further investigation and research. For example,

- improving the knowledge base to enable behavioural and physiological comparisons of circus animals with conspecifics in other environments; and
- comparative data on other animals regularly transported to shows and competitions, for example horses and dogs.

5.8 ACKNOWLEDGMENT

5.8.1. The Academic panel acted entirely independently and separately from their nominating sub-group. The six members of the Panel generously gave their time voluntarily and were not reimbursed by their nominating Sub-Group or Defra.

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6. THE IMPLICATIONS OF THE ACADEMIC PANEL'S REPORT

6.1. INTRODUCTION

- 6.1.1. During the passage of the Animal Welfare Bill, the Minister told the House of Commons that the Circus Working Group will consider the scientific evidence and make recommendations to inform Ministers and to inform the debate. However, its role is to inform, not to prepare a binding list, and it is premature to draw conclusions as to the evidence that it will provide.⁶
- 6.1.2. The process adopted provided both the Industry Sub-Group and the Welfare Organisations Sub-Group with a substantial degree of autonomy: each was invited to set out its respective arguments; to identify and marshal the scientific evidence which it judged best advanced its case; and to nominate appropriate experts to assess the material.
- 6.1.3. On the basis of the evidence they were asked to consider, those experts have agreed that there appears to be little evidence to demonstrate that the welfare of animals kept in travelling circuses is any better or any worse than that of animals kept in other captive environments.
- 6.1.4. In the light of the Academic Panel's conclusions, it would be inappropriate to make any specific recommendation; better to consider the implications of its Report with a view to informing Ministers and informing the debate.

6.2. THE SIGNIFICANCE OF THE ACADEMIC PANEL'S CONCLUSIONS

- 6.2.1. The significance of the Academic Panel's conclusions is twofold.
- 6.2.2. First, the conclusions should not be regarded as establishing conclusively one way or the other whether the welfare of non-domesticated circus animals is either compromised or of an acceptable standard. The Panel did not undertake its own investigations, neither was any independent research commissioned as part of the present process. The Panel could reach its conclusions only on the basis of the evidence which was submitted by the two Sub-Groups, and it is apparent from the Panel's report that it had serious reservations about the cogency and relevance of much of the material. Thus, the Panel states that it was "disappointed with the evidence". It further concluded that the particularity of the circus environment was such that research findings relating to animals kept in other contexts was not helpful, and there was a difference of

opinion on the significance to be attached to the studies which were concerned with circus animals.

- 6.2.3. Despite the best efforts of the respective Sub-Groups to present what each regarded to be the most persuasive evidence to support its case, the question as to the precise effect of the circus environment on the welfare of non-domesticated animals remains open. Accordingly, neither side of the debate should regard the issue to have been adequately resolved. As the eminent veterinarian, Lord Soulsby of Swaffham Prior, observed when this issue was debated in the House of Lords, “We know little about the physiology and the sentience of the exotic species that often used to be seen – and still are – in some travelling circuses.”⁷
- 6.2.4. Notwithstanding this situation, the Academic Panel’s conclusions undoubtedly have profound legal implications in the present context. This is the second area of significance of its Report and is further discussed below.

6.3. MINISTERIAL POLICY

- 6.3.1. During the passage through Parliament of the Animal Welfare Bill, responsible Ministers adopted a consistent policy towards non-domesticated animals in circuses: they rejected proposals for a blanket ban, indicating instead that they were minded to introduce a ban on specific types of animals by means of a regulation made under the authority of section 12. In doing so, they repeatedly indicated that the basis of such a ban would be scientific evidence that the welfare needs of the animal to which it applied cannot be satisfactorily met in that environment.
- 6.3.2. Thus, in Standing Committee, Ben Bradshaw responded to an amendment which would have had the effect of banning the use of all non-domesticated animals in circuses in the following terms:

...we should think very carefully about banning an activity unless we are convinced that it is unavoidably cruel or that the welfare needs of all animals involved cannot be met....We should acknowledge that most of the wild animals used in circuses are, in fact, captive bred. With all species...there is a debate about where we should draw the line, not only on the animal’s definition but on whether it is strictly the case that it is impossible in circus conditions to meet the welfare needs of every animal that we would normally describe as wild. I am advised that it is not possible to say that categorically. For me, that doubt is one reason – a fundamental one – to oppose the banning of wild animals....The fundamental point I want to get across is that I share my hon. Friend’s concerns – in some circuses, current practices do not meet acceptable welfare standards. I also accept that it is likely that the welfare needs of some, if not most, cannot be met in circus conditions. However, both these concerns are best met by regulation

7 House of Lords, 23 May 2006, col GC 169.

rather than a blanket ban.⁸

6.3.3. Similarly, in his Statement of 8 March 2006 setting out the Government's policy, the Minister said that he intended "to use a regulation under clause 10 of the Animal Welfare Bill [now section 12 of the Act] to ban the use in travelling circuses of certain non-domesticated species whose welfare needs cannot be satisfactorily met in that environment."⁹

6.3.4. As has already been noted,¹⁰ Lord Rooker told the House of Lords that "When deciding whether types of wild animals are suitable for performance in travelling circuses, decisions will need to be anchored in what the available scientific evidence tells us".

6.3.5. He explained further at Third Reading:

The Government's commitment to ban certain non-domesticated species will be based on scientific evidence.¹¹

6.3.6. Later in the same debate, Lord Rooker reiterated the point: "We have always proposed to ban certain species of wild animals on the basis of scientific evidence"; he then repeated it only two paragraphs later: "The Government's commitment to ban certain non-domesticated species will be based on scientific evidence"¹².

6.4. THE CONSEQUENCES OF THIS REPORT

(a) England

6.4.1. The power to make regulations under the authority of section 12 is wide, but nevertheless must be used in accordance with the normal principles of administrative law. In particular, Ministers are required to have regard to relevant considerations and disregard irrelevant considerations; it may be used only for the purpose which Parliament intended; and it must be used in a proportionate manner.

6.4.2. Ministers will wish to receive the advice of their own lawyers but, taking account of these ministerial statements in the context of the Academic Panel's Report, it is submitted that to introduce a ban on the use of any type of non-domesticated animal presently in use by circuses in the United Kingdom – and possibly a ban of a more general nature – by way of a Regulation made under the authority of section 12 of the Animal Welfare Act would be vulnerable to legal challenge.

8 Standing Committee A, 24 January 2006, col 237.

9 8 March 2006, col 60WS.

10 See para 4.1.1. above.

11 1 November 2006, col 315.

12 1 November 2006, col 317.

- 6.3.7. This conclusion is based on four considerations.
- 6.3.8. First, in their statements, Ministers clearly stated or otherwise implied that their decisions would be based on consideration of the scientific evidence. It is suggested that they are bound by the conclusions that have been drawn from that evidence unless there are very pressing reasons to bring other factors into account. To adopt a policy which did not follow the evidence, especially in circumstances where a group had been established specifically for the purpose of identifying and reviewing that evidence, would be vulnerable to legal challenge.
- 6.3.9. Second, the power to make regulations under section 12 is provided for the purpose of promoting the welfare of animals. The term ‘animal welfare’ is not defined in the Animal Welfare Act, but it is widely accepted to be scientific in nature. The Committee of Inquiry into Hunting with Dogs in England and Wales (the Burns Committee) described it in the following terms:
- Animal welfare is a scientific discipline which has developed rapidly in recent years. It is essentially concerned with assessing the ability of an animal to cope with its environment: if an animal is having difficulty in coping with its environment, or is failing to cope, then its welfare may be regarded as poor. This judgement is distinct from any ethical or moral judgements about the way in which the animal is being treated.¹³
- 6.3.10. Precisely so. While section 12 does not specify that regulations introduced under its authority must be based on scientific evidence (unlike, for example, the enabling power contained in section 1(4)), even if Ministers had not committed themselves to basing their decision on the scientific evidence, it is submitted that the generally held meaning of the term ‘animal welfare’ would have required them to focus on the available science. In particular, a decision which was based on ethical or moral considerations as to the acceptability or otherwise of using non-domesticated animals in circuses would, it is suggested, be liable to legal challenge.
- 6.3.11. Third, it is considered that to impose a ban on the use of non-domesticated animals in circuses by way of delegated legislation in the absence of compelling scientific evidence would be susceptible to legal challenge on the ground that such a measure was disproportionate.
- 6.3.12. The fourth point focuses on the nature of the power contained in section 12. On the one hand, it provides the appropriate national authority with the power by means of regulations to make such provision as the authority thinks fit for the purpose of promoting the welfare of animals for which a person is responsible. On the one hand, the subjective test – “as the authority thinks fit” – provides it with considerable discretion; on the other, the scope of the power is restricted in that, as has already been discussed, it must be for the purpose of promoting animal welfare. It may be reasonably argued that the term ‘animal

welfare’ means more in this context than simply an assessment of how an animal is ‘coping’ with its environment. One of the underlying policy objectives of the legislation is to secure a reasonable quality of life for protected animals. Accordingly, by reference to section 9, it can be reasonably implied that ‘animal welfare’ is intended to be principally, if not exclusively, concerned with meeting an animal’s needs.

6.3.13. When this provision was considered by the House of Lords’ Committee on Delegated Powers and Regulatory Reform, it explicitly stated that:

paragraph 38 of the memorandum [submitted to it by Defra] refers to a proposed use of the power to prohibit the use of certain species of wild animals in travelling circuses. The power is not just about prescribing welfare standards. It appears to the Committee to be sufficiently wide to prohibit or restrict (for the stated purpose) well-established activities, such as horseracing, greyhound racing, keeping of game birds and managing circuses.¹⁴

6.3.14. It is for the courts to give an authoritative view of the precise scope of the power, but it is submitted that if the provision is indeed sufficiently extensive to enable an activity to be banned – and it is arguable that it is not – a very high threshold would have to be met: it would be incumbent on Ministers not only to identify the relevant scientific evidence on which their decision was based, but also to demonstrate how a ban would promote animal welfare by ensuring the needs of the animals involved. In other words, it is submitted that Ministers would not only have to identify nature of the welfare problem they were seeking to address, but also explain how a ban would improve the situation. It is suggested that on the basis of the evidence before Ministers, these requirements would be extremely difficult to meet in relation to animals presently being used by circuses in the United Kingdom.

(b) Wales

6.3.15. Ministers of the Welsh Assembly Government are in a slightly different position than those of the UK Government because they are not bound by express Parliamentary statements, neither were they directly party to the establishment of the Circus Working Group. Nevertheless, for the reasons set out in the proceeding paragraphs, it is submitted that in law Ministers are in essentially the same position as their Westminster counterparts.

(c) Scotland

6.3.16. The situation in Scotland is potentially somewhat different. For example, the equivalent provision contained in the Animal Health and Welfare (Scotland) Act 2006 provides that

14 House of Lords, Select Committee on Delegated Powers and Regulatory Reform (2006), Eighteenth Report, para 7.

The Scottish Ministers may by regulations make provision for the purposes of, and in connection with, securing the welfare of

- (a) animals for which a person is responsible,
- (b) the progeny of such animals.¹⁵

6.3.17. It is submitted that the adoption of the verb ‘secure’ provides a more extensive power than that provided by the verb ‘promote’ in the Animal Welfare Act. ‘Promote’ suggests furthering the progress of a cause, venture, or aim, whereas ‘secure’ generally means to succeed in obtaining a particular objective. Furthermore, section 26(2)(a) and (3) expressly provide that such regulations may include provision prescribing general or specific requirements or prohibitions relating to, inter alia, the prevention of suffering; the way in which animals are kept and looked after and the conditions in which they are kept; and how animals are transported.

6.3.18. Furthermore, section 28 provides an enabling power of which there is no equivalent in the Animal Welfare Act. Namely, secondary legislation may be introduced which prohibits the keeping at either domestic or other premises of any animals of a kind specified in the regulations. Such regulations must be for the purpose of securing the welfare of animals and, in determining whether to make such regulations in relation to a type of premises, the Scottish Ministers must have regard to whether (and the extent to which) adequate provision for the welfare of animals of the kind in question is capable of being made, and is likely to be made, at that type of premises.¹⁶

6.3.19. However, notwithstanding these more extensive powers, it is submitted that in the light of the Academic Panel’s Report, Scottish Ministers would nevertheless have difficulty in justifying the imposition of a ban by way of regulations.

6.3.20. It is concluded, then, that in relation to England, Wales, and Scotland, the consequence of the Academic Panel’s Report is that Ministers do not have before them scientific evidence sufficient to demonstrate that travelling circuses are not compatible with meeting the welfare needs of any type of non-domesticated animal presently being used in the United Kingdom. It is further submitted that such a decision must be based on scientific evidence, and other considerations are extraneous, and therefore unlawful in the context of section 12. Furthermore, in the absence of compelling scientific evidence, any attempt to ban the use of an animal would fall foul of the principle of proportionality. Accordingly, it is proposed that further primary legislation would be required to have any realistic prospect of achieving a lawful ban.

15 Section 26(1).

16 Section 28(3), (5).

7. THE NEED FOR REFORM

7.1. CONSIDERATION OF THE ACADEMIC PANEL'S RECOMMENDATIONS

- 7.1.1. In the view of the Academic Panel, the general provisions of the Animal Welfare Act should be relied upon to protect the welfare of non-domesticated circus animals, together with codes of practice and a revision of the legislative regime relating to the trainers of performing animals. In addition, the Panel considers that there is a need for further investigation and research.
- 7.1.2. It is a truth universally acknowledged, that a scientist in possession of a report must be in want of further research. The submissions of the two Sub-Groups have confirmed the paucity of material in the scientific literature directly relevant to non-domesticated animals in travelling circuses. Furthermore, the Academic Panel concluded that the literature relating to the housing and transport of animals in other contexts, such as agriculture and zoos, could not be applied to circus animals. It would seem, therefore, that based on the scientific literature alone, our understanding of the impact of the circus environment on the welfare of non-domesticated animals is somewhat limited. Nevertheless, in view of the relatively small number of animals involved, it is doubted that the results of further research would be sufficiently meaningful and robust better to inform the debate. On this basis, it would be difficult to justify the expense, and could be regarded in some quarters as merely a delaying tactic.
- 7.1.3. The Academic Panel's suggestion that the general provisions of the Animal Welfare Act together with a code of practice can be relied upon to protect the welfare of the animals involved may seem appropriate from a scientific perspective, but these would not in themselves adequately address the associated political, legal and administrative issues.
- 7.1.4. It is the case that the Animal Welfare Act imposes greater legal obligations on those responsible for circus animals than hitherto, as, indeed, it does on all those who have assumed responsibility for an animal. They are now under a duty to take such steps as are reasonable in all the circumstances to ensure that the needs of their animals are met to the extent required by good practice.¹⁷ To rely exclusively on this provision would seem to be unsatisfactory for a number of reasons. First, the number of animals involved is so small that it would be difficult to lay down an objective test which precisely defines 'good practice' in this context. Second, a breach of any such code would not in itself constitute an offence; it would still have to be established beyond reasonable doubt that the responsible person had not taken such steps as are reasonable in all the circumstances to ensure the needs of an animal. Third, the circumstances to which it is relevant to have regard when applying this test specifically include any lawful purpose for which the animal is kept, and any lawful activity undertaken in relation to an animal. Their use in circuses

17 Animal Welfare Act 2006, s 9(1).

would remain a lawful activity and, depending on the attitude of the courts, this provision might serve to undermine the potential effectiveness in this context of the duty to ensure welfare. Conversely, as a result of a successful prosecution, whether brought by a public authority or by means of a private prosecution, the circus industry could find that practices which it had assumed remained lawful were no longer so. In consequence, it is thought that reliance on the duty to ensure welfare alone would not provide sufficiently clear and robust standards to satisfy either political opinion or the need for certainty and specificity as to what is, and what is not, required of circuses.

- 7.1.5. This is the same conclusion reached by the Minister. Ben Bradshaw specifically rejected the suggestion that what is now section 9 was, in itself, sufficient to regulate the use of non-domesticated animals in circuses because he was not convinced “that by itself this element of the Animal Welfare [Act] will provide sufficient clarity to circus proprietors and enforcers on what is permitted and what is not”.¹⁸

7.2. THE STATUS QUO IS NOT AN OPTION

- 7.2.1. Accordingly, notwithstanding the conclusion of the Academic Panel, it is submitted that the status quo is not a tenable option. First, expectations have been raised that the Government will do something. Second, the circus industry is exceptional in that the use of animals in most other commercial contexts is generally subject to specific regulation. Third, the present state of uncertainty confronting circuses requires resolution. Fourth, it is considered that the present situation is acting against the interests of the animals involved. For example, it has been suggested that circus proprietors are reluctant to make significant further investment in their facilities unless they have sufficient confidence that the use of the relevant animals will remain lawful. Similarly, there appears to be force in the contention that prohibitions by local authorities on the use of their land is forcing circuses to use private sites which in many cases are less suitable for the animals. Finally, and most significantly, there is support from all sides of the debate for reform.
- 7.2.2. First and foremost, it is self-evident from events surrounding the enactment of the Animal Welfare Act that Parliament is exercised and concerned by this issue. During the passage of the Bill amendments were put down in the Commons which would have respectively banned the use of wild animals in circuses, banned all animals in circuses, and permitted only (undefined) designated animals to be used. In the Lords, amendments were proposed which would: have banned all animals in circuses subject to the possibility of exemptions; banned all wild animals from circuses; and have made it an offence to keep or use a circus animal not designated by regulations.
- 7.2.3. In addition, the Environment, Food and Rural Affairs Committee, as part of its pre-legislative scrutiny of the Animal Welfare Bill, recommended that what it referred to as ‘wild animals’ should be phased out by imposing a prohibition

on circuses “either to bring in new wild animals or to breed from their existing wild animals”.¹⁹ Furthermore, an Early Day Motion which urged that the Animal Welfare Bill be used “to end the use of animals in traveling circuses and to take measures to protect performing animals in permanent facilities through regulation” attracted 144 signatures (an opposing amendment gained only 4 signatures),²⁰ and a further EDM which called on the Government “to introduce measures to end the use of wild animals in circuses in the forthcoming Animal Welfare Bill” secured 114 signatures.²¹

- 7.2.3. Similarly, the circus industry itself accepts the need for change. In the memorandum it submitted to the Environment, Food and Rural Affairs Committee, the Association of Circus Proprietors of Great Britain recognised that “the present legislation on the keeping and training of animals used in entertainment is inadequate”,²² and the Association’s Secretary stated in his oral evidence to the Committee that “we welcome legislation which seeks to regulate circuses”, observing that “We are a surprisingly unregulated industry”.²³ For its part, the European Circus Association has stated that it “strongly supports good regulation for circuses and performing animals in order to establish and maintain a high standard across the circus sector”.²⁴ Finally, it goes without saying that the animal welfare organisations have pursued long-standing campaigns for reform.
- 7.2.4. However, while there is widespread agreement about the need for change, there is no consensus about the form it should take.

19 *The Draft Animal Welfare Bill* (2004), HC 52-I, para 381.

20 EDM 1626 Animal Welfare (No 2), 13 February 2006.

21 EDM 468 Circus Animal Welfare, 29 June 2006.

22 *The Draft Animal Welfare Bill* (2004), HC 52-II, Ev 216.

23 *Ibid.*, Q507.

24 European Circus Association, *Proposed Model Regulations for the Care, Transport, and Presentation of Animals in the Circus* (in draft, 2007), Introductory Note.

8. THE OPTIONS

8.1. THE PRESENT SITUATION

- 8.1.1. At present, travelling circuses are not subject to any regulation relating to the protection of animals over and above that which applies to any person who assumes responsibility for an animal under the Animal Welfare Act, except that those who exhibit or train performing animals are required to register with his or her local authority (the Performing Animals (Regulation) Act 1925). This legislation is not, however, intended to promote welfare and its provisions are widely regarded to be ineffective.
- 8.1.2. Travelling circuses are specifically excluded from the ambit of the Dangerous Wild Animals Act 1976 and the Zoo Licensing Act 1981 (in *South Kesteven DC v Mackie* it was held that the exemption under the DWA extended to circus winter quarters).

8.2. SELF REGULATION

- 8.2.1. It is submitted that self-regulation represented by, for example, the Association of Circus Proprietors' 'Standards for the Care and Welfare of Circus Animals on Tour', has proved to be inadequate to meet public and political concern to which this issue gives rise. Indeed, it is the perceived failure of self-regulation which has contributed to the demand for reform. If non-domesticated animals are to continue to be used in travelling circuses, it is considered that public opinion will require a regulatory system which delivers independence, transparency and accountability.

8.3. THE IMPOSITION OF A BAN

- 8.3.1. There was a widespread assumption at the outset of the Circus Working Group's task that it would lead eventually to a ban on the use of at least some types of non-domesticated animals. As has been explained, this cannot be achieved in present circumstances using secondary legislation; there would need to be primary legislation.
- 8.3.2. In enacting primary legislation, Parliament is, of course, in a very different situation from that of a Minister bringing forward regulations. Parliament would not, for example, be confined to taking account of the scientific evidence. It could legitimately give consideration to ethical issues, public opinion, and it is able to attach greater weight to the interests of the animals involved. Furthermore, where there is uncertainty as to the impact on the welfare of the animals, Parliament may give them the benefit of the doubt in a manner which is simply not open to a minister employing delegated statutory powers.

- 8.3.3. To stand any realistic chance of succeeding, proposals would have to be brought forward in either a Government Bill, or a Private Member's Bill sponsored by an MP with a high position in the ballot.
- 8.3.4. Leaving aside the vagaries of the parliamentary process, it has been questioned whether such legislation could be drafted so as to be compatible with either EU law or the Human Rights Act 1981. The sponsors of such a Bill would need to take detailed legal advice on the matter. However, the decision of the Court of Appeal in the challenges to the Hunting Act²⁵ would appear to be relevant to the present case (while it remains good law at the time of writing, the decision is subject to appeal before the House of Lords). It will be recalled that the court rejected the challenges to the Act, holding that it was compatible both with EU law and the Human Rights Act. In so doing, the court gave weight to the fact that, in its view, the objective of the Hunting Act is a composite one of preventing or reducing unnecessary suffering to, in this case, wild mammals, together with the view that causing suffering for sport is unethical.
- 8.3.5. Furthermore, in response to a complaint that Austria had banned wild animals in circuses, it is understood that the European Commission concluded that the question of how to protect wild animals in circuses is not one to be decided at Community level, but rather should be left to Member States.

8.4. STATUTORY REGULATION

- 8.4.1. If it were decided to introduce a system of independent regulation, perhaps the most straightforward way of proceeding would be to amend the Zoo Licensing Act so as to bring circuses within its terms so far as is appropriate. However, this strategy would give rise to three issues. First, the Act contains no relevant enabling power, so primary legislation would be necessary to effect such a change. Second, the Zoo Licensing Act, as amended, gives effect to the EU Zoos Directive, which does not apply to circuses and not all of the Act's provisions are relevant. In particular, the Directive requires zoos to be involved in education and conservation programmes. It is acknowledged that some circuses claim to make a contribution to education and/or conservation, but these are unconvincing compared to the resources and expertise which zoos now devote to these activities. Third, it is understood that the zoo community would might be less than enthusiastic at the prospect.
- 8.4.2. Nevertheless, the provisions of the Zoo Licensing Act do seem to have much to offer: they provide an established and, at least in part, appropriate model, thereby avoiding the need to work up a regulatory system from scratch. Furthermore, Ministers have already indicated that they intend to refer to zoo standards in relation to circus winter quarters,

25 *R (on the application of the Countryside Alliance and others) v Attorney General and others; R (on the application of Derwin and others) v Attorney General and others* [2006] EWCA Civ 817.

- 8.4.3. If the continued use of non-domesticated animals in circuses is to be permitted, it is therefore suggested that consideration be given to introducing a regulation under section 13 of the Animal Welfare Act to instigate a licensing regime for circuses which use non-domesticated animals, such a scheme to be based on the relevant provisions of the Zoo Licensing Act.
- 8.4.4. Such regulations would make it an offence to operate a circus to which the regulations applied except under the authority of a licence. Under the regulations, circuses (adapting the language of section 1A (c)-(f)) would be required to:
1. Accommodate their animals under conditions which aim to satisfy the biological requirement of the species to which they belong, including –
 - i. providing each animal with an environment well adapted to meet the physical, psychological and social needs of the species to which it belongs; and
 - ii. providing a high standard of animal husbandry with a developed programme of preventative and curative veterinary care and nutrition.
 2. Preventing the escape of animals and putting in place measures to be taken in the event of any escape or unauthorized release of animals.
 3. Preventing the intrusion of pests and vermin into the circus premises.
 4. Keeping up-to-date records of the circus's collection, including records of –
 - i. the numbers of different animals;
 - ii. acquisitions, births, deaths, disposals and escapes of animals;
 - iii. the causes of any such deaths; and
 - iv. the health of animals.
- 8.4.5. The basis of the standards to be imposed on circuses could be the relevant parts of the Secretary of State's Standards of Modern Zoo Practice. For example, those relating to: the provision of food and water, a suitable environment, animal health care, the opportunity to express most normal behaviour, and protection from fear and distress; transportation and movement of live animals; stock records; and staff training. It is also considered that an amended form of the requirement which is placed on zoos to have an ethical review process would also promote public confidence in the practices and procedures adopted by circuses. In addition, much of the advice contained in the Zoos Forum Handbook relating to the ethical review process and, especially, animal welfare and its assessment would appear to be directly relevant to circuses.
- 8.4.6. A further significant source of relevant standards may be the Proposed Model Regulations for the Care, Transport and Presentation of Animals in Circuses which is in the process of being agreed by the European Circus Association. A confidential draft of this document has been submitted to the Chairman, and both its nature and its contents would appear to represent a positive and significant development on the part of the industry, the terms of which could be incorporated into a legislative regulatory scheme.

- 8.4.7. Because of the very number of circuses using non-domesticated animals, it is thought more appropriate for an licensing scheme to be carried out in the name of the Secretary of State. Members of the Zoo Licensing Inspectorate would undertake the principal inspections. Local authority officers would have a role in carrying out a secondary inspection to ensure the prior agreed standards were being adhered to.
- 8.4.8. If a regulatory system were introduced which involved circus proprietors in significant amounts of expenditure to improve standards, any subsequent ban which Parliament might introduce would have to take this expenditure into account as part of a compensation scheme.

8.5. LOCAL AUTHORITY BANS

- 8.5.1 Many local authorities throughout Britain have banned circuses with animals from using their land. It has been suggested that the legal status of at least some of these bans may be uncertain. If the use of non-domesticated animals is to continue to be permitted, and if it were to be regularised through a licensing system, local authorities would be advised to reconsider whether these bans were still appropriate and lawful.

8.6. CONCLUSION

- 8.6.1. In a circular issued in 2002, the Government stated that

It believes that all captive animals should enjoy the same minimum welfare standards, aimed at ensuring a quality of life as good as can reasonably be achieved in the type of regime in which they are held. They should be held in accommodation, which is suitable in every key respect; adequately fed and watered; provided with veterinary care as necessary; and not be subjected to unnecessary suffering. Wherever practicable, standards should go beyond that – for example, to provide a rich and stimulating environment.²⁶

- 8.6.2. How these sentiments can best be put into practice is a political issue. The overriding conclusion of this exercise is that our present state of knowledge about the welfare of non-domesticated animals used in circuses is such that we cannot look to scientific evidence for a steer in the development of policy; it is, ultimately, an entirely political decision. Once the relevant policy is decided upon, its implementation is essentially a question of politics and law; science, on this occasion, provides no relevant guidance as to the appropriate principle to be adopted.

26 DEFRA, 'The Keeping of Wild Animals', Circular 1/2002

APPENDIX

REFERENCES CONSIDERED BY THE ACADEMIC PANEL

- Abaturov, B. D., Kassaye, F., Kuznetsov, G. V., Magomedov, M. R. D., Petelin, D. A. (1995) Nutritional estimate of populations of some wild free-ranging African ungulates in grassland (Nechisar national park, Ethiopia) in dry season. *Ecography* 18 (2): 164-172.
- Abeyesinghe, S.M. and Goddard, P.J. (1998) The preferences and behaviour of farmed red deer (*Cervus elaphus*) in the presence of other farmed species. *Applied Animal Behaviour Science* 56: 59-69
- Abeyesinghe, S.M., Goddard, P.J., Cockram, M.S. (1997) The behavioural and physiological responses of farmed red deer (*Cervus elephus*) penned adjacent to other species. *Applied Animal Behaviour Science*. 55: 163-175
- Adamec, R.E/Blundell, J. & Burton, P. (2005). Neural circuit changes mediating lasting brain and behavioural response to predator stress. *Neuroscience and Biobehavioral Reviews* 29: 1225-1241
- Agnew D.W., Munson, L. & Ramsay E.C. (2004) Cystic Endometrial Hyperplasia in Elephants. *Veterinary Pathology* 41:179-183
- Altman, J. D., Gross, K. L., Lowry, S. R. (2005) Nutritional and Behavioural Effects of Gorge and Fast Feeding in Captive Lions. *Journal of Applied Animal Welfare Science*. 8: 1 47-57
- Anderson, D.E, T Grubb, and Silveira.F, 'The Effect of Short Duration Transportation on Serum Cortisol Response in Alpacas (*Llama pacos*)', *The Veterinary Journal*, 157, 189–191 (1999).
- Anonymous (2004) Opinion of the Scientific Panel on Animal Health and Welfare on a request from the Commission related to the welfare of animals during transport. *EFSA Journal* 44: 1-36
- Anonymous (2004) The welfare of animals during transport. Scientific Report of the Scientific Panel on Animal Health and Welfare on a request from the Commission related to the welfare of animals during transport. European Food and Safety Authority, Annex to the Opinion [109], available at: http://www.efsa.europa.eu/etc/medialib/efsa/science/ahaw/ahaw_opinions/424.Par.0002.F ile.dat/ahaw_report_animaltransportwelfare_en1.pdf

- Apfelbach, R., Blanchard, C.D., Blanchard, R.J., Hayes, R.A. & McGregor, I.S. (2005), The Effects of Predator odors in mammalian prey species: A review of field and laboratory studies. *Neuroscience and Biobehavioral Reviews* 29: 1123-1144
- Armstrong, S. & Marples, N. (2003) Nutrition, foraging behaviour and space use by plains zebras (*Equus burchelli*) housed in mixed species exhibits. In: *Proceedings of the Fifth Annual Symposium on Zoo Research at Marwell Zoological Park* (ed. Gilbert, T.C.), pp. 84-93. Federation of Zoological Gardens of Great Britain and Ireland, London, UK
- Baldock, N.M & Sibly, R.M. (1990) Effects of handling and transportation on the heart rate and behaviour of sheep, *Applied Animal Behaviour Science*. 28 15-39
- Banks, M., Monsalve Torraca, L.S., Greenwood, A.G. & Taylor, D.C. (1999) Aujeszky's disease in captive bears. *Veterinary Record* 145: 362-365
- Barklow, W. E. (2004) Amphibious communication with sound in hippos, *Hippopotamus amphibious*. *Animal Behaviour* 68: 1125-1132.
- Barnard, C.J. & Hurst, J.L. (1996) Welfare by design: the natural selection of welfare criteria. *Animal Welfare* 5: 405-433
- Barnett, J.L. & Hemsworth, P.H. (1990) The validity of physiological and behavioural measures of animal welfare. *Applied Animal Behaviour Science* 25: 177-187
- Barnett, J.L., Cronin, G.M., Winfield, C.G. & Dewar, A.M. (1984) The welfare of adult pigs: the effect of five housing treatments on behaviour, plasma corticosteroids and injuries. *Applied Animal Behaviour Science* 12: 209-232
- Barnett, J.L., Winfield, C.G. Cronin, G.M., Hemsworth, P.H. & Dewar, A.M. (1985) The effect of individual and group housing on behavioural and physiological responses related the welfare of pregnant pigs. *Applied Animal Behaviour Science* 14: 149-161
- Barnett, K.E., Cocroft, R.B. & Fleishman, L.J. (1999) Possible communication by substrate vibration in a chameleon. *Copeia* 1: 225-228
- Bashaw, M.J., Bloomsmith, M.A., Marr, M.J. & Maple, T.L. (2003) To hunt or not to hunt? A feeding enrichment with captive large felids. *Zoo Biology* 22: 189-198
- Bashaw, M.J., Tarou, L. R., Maki, T.S. and Maple, T.L. (2001) A survey assessment of variables related to stereotypy in captive giraffes and okapi. *Applied Animal Behaviour Science* 73: 235-247
- Baucus, K. L., Squires, E.L., Ralston, S.L., McKinnon, A.O. and Nett, T. M. (1990b) Effect of transportation on the estrous cycle and concentrations of hormones in mares. *Journal of Animal Science*. 68:419-426
- Baucus, K.L., Ralston, S.L., Nockels, C.F., McKinnon, A.O. & Squires, E. L. (1990a) Effects of Transportation on Early Embryonic Death In Mares. *Journal of*

Animal Science. 68: 345-351

- Bauer, H. & de Iongh, H. H. (2005) Lion (*Panthera leo*) home ranges and livestock conflicts in Waza National Park, Cameroon. *African Journal of Ecology*. 43, 208-214
- Baxter, E. and Plowman, A.B. (2001) The effect of increasing dietary fibre on feeding, rumination and oral stereotypies in captive giraffes (*Giraffa camelopardalis*). *Animal Welfare* 10 (3): 281-290
- Benz, A. (2005) The elephant's hoof: Macroscopic and microscopic morphology of defined locations under consideration of pathological changes. Doctoral Thesis Vetsuisse-Fakultät, University of Zürich.
- Bernal, J.F. and Packard, J.M. (1997) Differences in winter activity, courtship, and social behavior of two captive family groups of Mexican wolves (*Canis lupus bailey*). *Zoo Biology* 16 (5): 435 – 443
- Birke, L. (2002) Effects of browse, human visitors and noise on the behaviour of captive orang utans. *Animal Welfare* 11: 189-202
- Birke, L. (2002) Effects of browse, human visitors and noise on the behaviour of captive orang utans. *Animal Welfare* 11: 189-202
- Boissy, A. & Le Neindre, P. (1997) Behavioural, Cardiac and Cortisol Responses to brief peer separation and reunion in cattle. *Physiology and Behaviour*. 61: 693-699 Cassinello, G. & Pieters, I. (2000) Multi-male captive groups of endangered Dama Gazelle: Social rank, Aggression and Enclosure effects. *Zoo Biology*. 19 121-129
- Bornett-Gauci, H.L.I., Martin, J.E., Arney, D.R. (2006) The welfare of low-volume farm animals during transport and at slaughter: a review of current knowledge and recommendations for future research. *Animal Welfare* 15 (3): 299-308
- Bowles, A.E. & Thompson, S.J. (1996) A review of nonauditory physiological effects of noise on animals. *Journal of the Acoustical Society* 100: 2708
- Boyd Group Papers on The Use Of Non-Human Primates in Research and Testing June 2002 – Paper 2: Empirical evidence on the moral status of non-human primates, pp. 20-32
- Boyd, L. (1986) Behavior problems of equids in zoos. *The Veterinary Clinics of North America. Equine Practice* 2: 653-664
- Boyd, L.E. (1988) Time budgets of adult Przewalski horses: effects of sex, reproductive status and enclosure. *Applied Animal Behaviour Science* 21: 19-39
- Boydston, E. E., Morelli, T. L. and Holekamp, K. E. (2001) Sex differences in territorial behavior exhibited by the spotted hyena (*Hyaenidae, Crocuta crocuta*) *Ethology* 107 (5): 369-385.
- Bradshaw, G. A., Schore, A. N., Brown, J. L., Poole, J. H. & Moss, C. J. (2005)

Elephant breakdown – Social trauma: early disruption of attachment can affect the physiology, behaviour and culture of animals and humans over generations. *Nature*. 433:807

- Broom & Johnson, 1993, 'Stress and animal welfare', Chapman and Hall, *Animal Behaviour*.14
- Broom, D. (2000) Welfare assessment and the welfare problem areas during handling and transport. In Grandin, T. (ed) *Livestock Handling and Transport*. CAB International. Chapter Four, pp35-42.
- Broom, D.M. (1991) Animal welfare: concepts and measurement. *Journal of Animal Science* 69: 4167-4175
- Brown, J. L. (2000) Reproductive Endocrine Monitoring of Elephants: An Essential Tool for Assisting Captive Management. *Zoo Biology*. 19:347-367
- Brown, J.L., Olson, D., Keele, M. & Freeman, E.W. (2004) Survey of the reproductive cyclicity status of Asian and African elephants in North America. *Zoo Biology* 23: 309- 321
- Burnie, D. (eds) (2001) *Animal – the definitive visual guide to the world's wildlife*. Dorling Kindersley Limited. London. UK
- C.W. Hyatt, T. Metzler, B. French and D. Fahrenbruck: "Mirrors as Enrichment for Asian Elephants" *Journal of Elephant Managers Association*, 14:3 (2003).
- Carlstead K & Seidensticker J (1991). Seasonal variation in stereotypic pacing in an American black bear *Ursus americanus*. *Behavioural Processes* 25: 155-161
- Carlstead, K. & Seidensticker, J. (1991) Seasonal variation in stereotypic pacing in an American black bear *Ursus americanus*. *Behavioural Processes* 25: 155-161
- Carlstead, K. & Shepherdson, D. (1994) Effects of environmental enrichment on reproduction. *Zoo Biology* 13: 447-458
- Carlstead, K. & Shepherdson, D. (2000) Alleviating stress in zoo animals with environmental enrichment. In: *The biology of animal stress* (eds. Moberg, G.P. & Mench, J.A.), pp. 337-354. CABI Publishing, Oxon, UK
- Carlstead, K., Brown, J. L. & Seidensticker, J. (1993) Behavioural and Adrenocortical Responses to Environmental Changes in Leopard Cats (*Felis bengalensis*) *Zoo Biology*. 12: 321-331
- Carlstead, K., Brown, J.L., Monfort, S.L., Killens, R. & Wildt, D.E. (1992) Urinary monitoring of adrenal responses to psychological stressors in domestic and nondomestic felids. *Zoo Biology* 11: 165-176
- Carlstead, K., 'Effects of captivity on the behavior of wild mammals.', in Klieman, DG, ME Allen, and Thompson KV (eds.), *Wild mammals in captivity*. University of Chicago Press: University of Chicago Press.), p 317–33 (1996).
- Carlstead, K., Fraser, J., Bennett, C., Kleiman, K. (1999) Black Rhinoceros (*Diceros bicornis*) in U.S. Zoos: Behaviour, Breeding success and Mortality in Relation

- to Housing facilities. *Zoo Biology*. 18:35-52.
- Cassinello, J. and Pieters, I. (2000) Multi-male captive groups of endangered Damara gazelle: social rank, aggression, and enclosure effects. *Zoo Biology* 19:121-129
- Chandra, B.S. and Das, N. (2001) The handling and short-haul road transportation of spent buffaloes in relation to bruising and animal welfare. *Tropical Animal Health Production* 33: 155 – 163
- Chapenoire, S., Camiade, B. & Legros, M. (2001) Basic instinct of a feline. *American Journal of Forensic Medicine and Pathology* 22: 46-50
- Childs-Sanford, S.E. and Angel, C.R. (2006) Transit time and digestibility of two experimental diets in the maned wolf (*Chrysocyon brachyurus*) and domestic dog (*Canis lupus*). *Zoo Biology* 25 (5): 369-381
- Chitty, J. (2003) Feather plucking in psittacine birds 2. Social, environmental and behavioural considerations. *In Practice* 25: 550-555
- Chitty, J. (2003)a Feather plucking in psittacine birds 1. Presentation and medical investigation. *In Practice* 25: 484-493
- Cimino, R. (1994) Cooperative elephant breeding between zoos and circuses - a realistic proposal? *International Zoo News* 41: 29-35
- Clark, H.W., Laughlin, D.C., Bailey, J.S. & Brown, T.McP. (1980) Mycoplasma species and arthritis in captive elephants. *Journal of Zoo Animal Medicine* 11: 3-15
- Clauss, M. & Hatt, J.-M. (2006) The feeding of rhinoceros in captivity. *International Zoo Yearbook* 40:197-209.
- Clauss, M., Lechner-Doll, M., Flach, E.J., Tack, C. and Hatt, J. (2001) Comparative Use of Four Different Marker Systems for the Estimation of Digestibility and Low Food Intake in a Group of Captive Giraffes (*Giraffa camelopardalis*). *Zoo Biology* 20: 315-329
- Clermont, E. (2005) Circuses and elephants: the truth under the big top. *AV Magazine* 113: 12-14
- Clubb R & Mason G (2003). Captivity effects on wide-ranging carnivores. *Nature* 425: 473-474
- Clubb, R. & Mason, G. (2002) A review of the welfare of zoo elephants in Europe. RSPCA, Horsham, West Sussex, UK
- Clubb, R. & Mason, G. (2003) Captivity effects on wide-ranging carnivores. *Nature* 425: 473-474
- Clubb, R., & Mason, G. J. (2006) Natural behavioural biology as a risk factor in carnivore welfare: How analysing species differences could help zoos improve enclosures. *Applied Animal Behaviour Science* doi: 10.1016/j.applanim.2006.05.033

- Clutton-Brock, J. (1995) Origins of the domestic dog: domestication and early history. In: Serpell, J. *The Domestic Dog, its evolution, behaviour and interactions with people*, pp7-20. Cambridge University Press, UK.
- Clutton-Brock, J., 1999 'A Natural History of Domesticated Mammals'. Cambridge University Press.
- Cociu, M., Wagner, G., Micu, N.E. & Mihaescu, G. (1974) Adaptational gastro-enteritis in Siberian tigers *Panthera tigris altaica* at Bucharest Zoo. *International Zoo Yearbook* 14: 171-174
- Coffey, K. P. (2001) Basic principles and economics of transportation shrink in beef cattle. *Professional Animal Scientist*.
- Collins, M. N., Friend, T. H., Jousan, F. D, & Chen, S. C. (2000) Effects of density on displacement, falls, injuries and orientation during horse transportation. *Applied Animal Behaviour Science*. 67:169-179
- Conway, W. (2003) The role of zoos in the 21st Century. *International Zoo Yearbook* 38: 7-13
- Cooper, J.J. & Albentosa, M.J. (2005) Behavioural adaptation in the domestic horse: potential role of apparently abnormal responses including stereotypic behaviour. *Livestock Production Science* 92: 177-182
- Coppinger, R. & Schneider, R. (1995) Evolution of working dogs. In: *The domestic dog: its evolution, behaviour and interactions with people* (ed. Serpell, J.), pp. 21-47. Cambridge University Press, Cambridge, UK
- Cote, J., and Clobert, J. (2006) Social personalities influence natal dispersal in a lizard *Proc. R. Soc. B*; doi:10.1098/rspb.2006.3734
- Cowgell, J. & Underwood, H. (1979) Behavioral thermoregulation in lizards: a circadian rhythm. *Journal of Experimental Zoology* 210: 189-194
- Creel, S. (2001) Social dominance and stress hormones. *Trends in Ecology & Evolution* 16 (9): 491-497
- Crockford (2002) in Spotorno, A.E., Marín, J.C., Manríquez, G. Valladares, J.P., Rico, E. & Rivas, C. (2006) Ancient and modern steps during the domestication of guinea pigs (*Cavia porcellus* L.) *Journal of Zoology* 270: 57-62
- Dawkins, M.S. (1990) From an animal's point of view: motivation, fitness, and animal welfare. *Behavioral and Brain Sciences* 13: 1-61
- De Rouck M, Kitchener AC, Law G & Nelissen M (2005). A comparative study of the influence of social housing conditions on the behaviour of captive tigers (*Panthera tigris*). *Animal Welfare* 14:229-238
- Debyser, I.W.J. (1995) Prosimian juvenile mortality in zoos and primate centers. *International Journal of Primatology* 16: 889-907
- Dembiec, D.P., Snider, R.J. & Zanella, A.J. (2004) The effects of transport stress on

tiger physiology and behaviour. *Zoo Biology* 23: 335-346

- Derschowitz, A., Favre, D., Fouts, R., Goodall, J., Sunstein, C., Wise, S., Waldau, P. & Wrangham, R. (2003). The evolving legal status of chimpanzees. *Animal Law* 9: 1-95.
- Desmond, T. & Laule, G. (1994) Use of positive reinforcement training in the management of species for reproduction. *Zoo Biology* 13: 471-477
- Di Bitetti, M.S. (2001) Home-range use by the tufted capuchin monkey (*Cebus apella nigrurus*) in a subtropical rainforest in Argentina. *Journal of Zoology* 253: 33-45
- Dierenfeld, E. S., Atkinson, S., Craig, A. M., Walker, K. C., Streich, W. J. & Clauss, M. (2005) Mineral concentrations in Serum/Plasma and liver tissue of captive and free-ranging rhinoceros species. *Zoo Biology*. 24:51-72.
- Dierenfeld, E. S., du Toit, R. & Miller, R. E. (1988) Vitamin E in Captive and Wild Black Rhinoceros (*Diceros bicornis*). *Journal of Wildlife Diseases*. 24(3):547-550.
- Dixit, V.D., Marahrens, M. and Parvizi, N. (2001) Transport stress modulates adrenocorticotropin secretion from peripheral bovine lymphocytes. *Journal of Animal Science*. 79: 729-734
- Dobney, K. & Larson, G. (2006) Genetics and animal domestication: new windows on an elusive process. *Journal of Zoology* 269: 261-271
- Drea, C. M., Vignieri, S. N., Kim, H. S., Weldele, M. L. and Glickman, S. E. (2002) Responses to olfactory stimuli in spotted hyenas (*Crocuta crocuta*): II. Discrimination of conspecific scent. *Journal of comparative psychology* 116 (4): 342-349.
- East, M. L. & Hofer, H. (2001) Male spotted hyenas (*Crocuta crocuta*) queue for status in social groups dominated by females. *Behavioral Ecology* 12 (5): 558-568.
- EC, Report of the Scientific Committee on Animal Health and Welfare, The welfare of animals kept for fur production, 2001.
- Edwards, G.P., Eldridge, S.R., Wurst, D., Berman, D.M. & Garbin, V. (2001) Movement patterns of female feral camels in central and northern Australia. *Wildlife Research* 28: 283-289
- Edwards, L.M., Rahe, C.H., Griffin, J.L., Wolfe, D.F., Marple, D.N., Cummins, K.A. & Pitchett, J.F. (1987) Effect of transportation stress on ovarian function in superovulated Hereford heifers. *Theriogenology* 28: 291-299]
- Engebretson, M. (2006) The Welfare and Suitability of Parrots as Companion Animals: A review. *Animal Welfare*. 15: 263-276
- Estes, R. D. (1999) Revised and Expanded: The Safari Companion – A guide to watching African Mammals. Chelsea Green Publishing co. South Africa

- European Commission: Scientific Committee on Animal Health and Animal Welfare (2002) The welfare of animals during transport (details for horses, pigs, sheep and cattle). EC Health & Consumer Protection Directorate-General, Directorate C -Scientific Opinions, C2 - Management of scientific committees; scientific co-operation and networks.
- European Food Safety Authority (EFSA) (2004) “The welfare of animals during transport” Scientific Report of the Scientific Panel on Animal Health and Welfare on a request from the Commission related to the welfare of animals during transport (Question N° EFSA-Q-2003-094)
- Ewert, J.-P., Cooper, J.E., Langton, T., Matz, G., Reilly, K. & Schwantje, H. (2004) Background information on the species-specific proposals for reptiles presented by the Expert Group on Amphibians and Reptiles. Part B. 8th Meeting of the Working Party for the preparation of the fourth multilateral consultation of parties to the European Convention for the Protection of Vertebrate Animals used for experimental and other scientific purposes (ETS 123). Council of Europe, Strasbourg
- Farm Animal Welfare Council UK (FAWC) (1985) Report on the welfare of farmed deer. Booklet 2498.
- Fazio, E., Medica, P., Alberghina, D., Cavaleri, S. and Ferlazzo, A. (2005) Effect of long-distance road transport on thyroid and adrenal function and haematocrit values in limousine cattle: influence of body weight decrease. *Veterinary Research Communications*. 29: 713-719
- Fersterer, P., Nolte, D. L., Ziegltrum, G. J., Gossow, H. (2001) Effect of Feeding Stations on the Home Ranges of American Black Bears in Western Washington. *Ursus* 12:51–54
- Fickel, J., Richman, L.K., Montali, R., Schaftenaar, W., Göritz, F., Hildebrandt, T.B. & Pitra, C. (2001) A variant of the endotheliotropic herpesvirus in Asian elephants (*Elephas maximus*) in European zoos. *Veterinary Microbiology* 82: 103-109
- Fischbacher, M. & Schmid, H. (1999) Feeding Enrichment and Stereotypic Behaviour in Spectacled Bears. *Zoo Biology*. 18: 363-371
- FitzRoy Hardy, D. ‘The use of domestic animals in zoo education’, California State University, Northridge. Zoo Licensing Act, 1981.
- Flombaum JI and Santos LR (2005) Rhesus monkeys attribute perceptions to others. *Current Biology* 15(5): 447-452
- Forthman, D.L. & Bakeman, R. (1992) Environmental and social influences on enclosure use and activity patterns of captive sloth bears (*Ursus ursinus*). *Zoo Biology* 11: 405-415
- Forthman, D.L. (1998) Chapter 14: Toward optimal care for confined ungulates. In Shepherdson, D.J., Mellen, J.D. and Hutchins, M. (1998) Second nature-environmental enrichment for captive animals. Smithsonian Institution Press. Washington and London. Pp 236 – 261.

- Fouts, D. H. & Fouts, R. S. (2000) Our emotional kin. In M. Bekoff (Ed.) The smile of a dolphin. New York: Discovery Books/ Random House, pp. 204-207
- Fouts, R. S. (2000) My best friend is a chimp. *Psychology Today* 32(4), 68-73
- Fouts, R. S., Fouts, D. H. and Waters, G. (2002). The ethics and efficacy of biomedical research in chimpanzees with special regard to HIV research. In: A. Fuentes and L. Wolfe (Eds.). *Primates face to face: Conservation implications of human-nonhuman primate interconnections*. Cambridge, UK: Cambridge University Press, pp. 45-60.
- Fowler, M.E. (2000a) Restraint and handling of camels. *Journal of Camel Practice and Research* 7 (1): 77-90
- Fowler, M.E. (2000b) The influence of behaviour on the health and well-being of camels and their handlers. *Journal of Camel Practice and Research* 7 (2): 129-142
- Fragasky DM, Visalberghi E and Fedigan LM (2004) *The Complete Capuchin: The Biology of the Genus Cebus*. Cambridge University Press.
- Frank, L. G., Glickman, S. E. and Licht, P (1991) Fatal sibling aggression, precocial development, and androgens in neonatal spotted hyenas. *Science*. 252 (5006): 702-704.
- Franklin, C. E., Davis, B. M., Peucker, S. K., Stephenson, H., Mayer, R., Whittier, J., Lever, J. and Grigg, G. C. (2003) Comparison of stress induced by manual restraint and immobilisation in the estuarine crocodile, *Crocodylus porosus*. *J Exp Zool A Comp Exp Biol*. 298(2):86-92
- Franz-Odendaal, T.A. (2004) Enamel hypoplasia provides insights into early systemic stress in wild and captive giraffes (*Giraffa camelopardalis*). *Journal of Zoology* 263 (2): 197-206
- Frezard, A. and Le Pape, G. (2003) Contribution to the welfare of captive wolves (*Canis lupus lupus*): A behavioral comparison of six wolf packs. *Zoo Biology* 22 (1): 33-44
- Friend TH & Parker ML (1999). The effect of penning versus picketing on stereotypic behavior of circus elephants. *Applied Animal Behaviour Science* 64: 213-225
- Friend TH (1999). Behavior of picketed circus elephants. *Applied Animal Behaviour Science* 62:73-88
- Friend USDA Report – Elephants (2001).
- Friend, T. H. (2001) A review of recent research on the transportation of horses. *Journal of Animal Science*. E32-E40
- Friend, T. H. “Final Report: Transportation and Management of Circus Animals: Transportation of Circus Elephants” USDA Contract No. 00-6100-0004-GR (July 30, 2001)
- Funding Andersen, K. (1991) Size, design and interspecific interactions as restrictors

- of natural behaviour in multi-species exhibits. 1. Activity and intraspecific interactions of Plains zebra (*Equus burchelli*). *Applied Animal Behaviour Science* 34: 157-174
- Funding Andersen, K. (1992) Size, design and interspecific interactions as restrictors of natural behaviour in multi-species exhibits. 3: interspecific interactions of Plains zebra (*Equus burchelli*) and eland (*Taurotragus oryx*). *Applied Animal Behaviour Science*, 34: 273-284
- Garner, J.P., Meehan, C.L. & Famula, T. R. (2006) Genetic, environmental, and neighbor effects on the severity of stereotypies and feather picking in Orange-winged Amazon parrots (*Amazona amazonica*): An epidemiological study. *Applied Animal Behaviour Science* 96:153 -168
- Garrick, L. D. and Lang, J. W. (1977) Social Signals and Behaviors of Adult Alligators and Crocodiles. *American Zoologist* 17(1):225-239.
- Gittleman, J.L. & Harvey, P.H. (1981) Carnivore Home-Range Size, Metabolic Needs and Ecology. *Behavioural Ecology and Sociobiology*. 10:57-63
- Goldhorn, W. & Kraft, H. (1985) Die tiergerechte Haltung von Zirkustieren [The proper care of circus animals]. *Tieraerztliche Umschau* 40: 809-814
- Goodwin, D. (1999) The importance of ethology in understanding the behaviour of the horse. *Equine Veterinary Journal Supplement* 28: 15-19
- Gore, M., Hutchins, M. & Ray, J. (2006) A review of injuries caused by elephants in captivity: an examination of predominant factors. *International Zoo Yearbook* 40: 51-62
- Goymann, W., Mostl, E., Van't Hof, T., East, M. L. and Hofer, H. (1999) Noninvasive fecal monitoring of glucocorticoids in spotted hyenas, *Crocuta crocuta*. *General and Comparative Endocrinology* 114 (3): 340-348.
- Grandia, P.A., Van Dijk, J.J., Koene, P. (2001) Stimulating natural behaviour in captive bears. *Ursus*. 12, 199-202
- Grandin, T. (1997) Assessment of stress during handling and transport. *Journal of Animal Science* 75: 249-257
- Grant, J. B., Brown, D. L. & Dierenfeld, E. S. (2002) Essential fatty acid profiles differ across diets and browse of Black Rhinoceros. *Journal of Wildlife Diseases*. 38(1):132-142.
- Grasso, F., Napolitano, F., de Rose, G., Quarantelli, T., Serpe, L. and Bordi, A. (1999) Effect of pen size on behavioural, endocrine, and immune responses of water buffalo (*Bubalus bubalis*) calves. *Journal of Animal Science* 77: 2039 - 2046
- Greenwood, A.G. (1985) Diagnosis and treatment of botulism in lions. *Veterinary Record* 117: 58-60
- Grigor, P. N., Goddard, P. J., Littlewood, C. A., Deakin D. W. (1998) Pre-transport loading of farmed deer: effects of previous overnight housing environment,

- vehicle illumination and shape of loading race. *Veterinary Record* 142(11): 265-268
- Grigor, P.N., Cockram, M.S., Steele, W.B., et al. (2004) A comparison of the welfare and meat quality of veal calves slaughtered on the farm with those subjected to transportation and lairage. *Livestock Production Science* 91 (3): 219-228
- Grigor, P.N., Goddard, P.J. and Littlewood, C.L. (1998a) The behavioural and physiological reactions of farmed red deer to transport: effects of sex, group size, space allowance and vehicular motion. *Applied Animal Behaviour Science* 56: 281 – 295
- Grigor, P.N., Goddard, P.J. and Littlewood, C.L. (1998b) The relative aversiveness of farmed red deer to transport, physical restraint, human proximity and social isolation. *Applied Animal Behaviour Science* 56: 255 – 262
- Grigor, P.N., Goddard, P.J., Littlewood, C.L. and Macdonald, A.J. (1998c) The behavioural and physiological reactions of farmed red deer to transport: effects of road type and journey time. *Applied Animal Behaviour Science* 56: 263 – 279
- Gruber, T.M., Friend, T.H., Gardner, J.M., Packard, J.M., Beaver, B. & Bushong, D. (2000) Variation in stereotypic behaviour related to restraint in circus elephants. *Zoo Biology* 19: 209-211
- H. Riddle, B. Rasmussen, and D. Schmitt: “Are captive elephants important to conservation?” *Gajah* 22 (July 2003)
- Ha, J.C., Robinette, R.L. & Sackett, G.P. (1999) Social housing and pregnancy outcome in captive pigtailed macaques. *American Journal of Primatology* 47: 153-163
- Hall, S.J.G. & Bradshaw, R.H. (1998) Welfare Aspects of the Transport by Road of Sheep and Pigs. *Journal of Applied Animal Welfare Science*. 1 (3) 235-254
- Holden, T. & Diller, H. (1996) *Collins Field Guide – Mammals of Africa including Madagascar*. Harper Collins Publishers. UK
- Hanlon et al., 1995, Effect of repeated changes in group composition on immune-response, behaviour, adrenal activity and liveweight gain in farmed red deer yearlings. *Applied Animal Behaviour Science*, 44(1):57-64.
- Hanlon, A.I., Rhind, S.M., Reid, H.W. et al. (1994) Relationship between immune-response, liveweight gain, behavior and adrenal-function in red deer (*Cervus elaphus*) calves derived from wild and farmed stock, maintained at 2 housing densities. *Applied Animal Behaviour Science* 41 (3-4): 243-255
- Hanlon, A.I., Rhind, S.M., Reid, H.W. et al. (1995) Effects of repeated changes in group composition on immune-response, behavior, adrenal activity and liveweight gain in farmed red deer yearlings. *Applied Animal Behaviour Science* 44 (1): 57-64
- Harlow, H.F. & Harlow, K. (1962) Social deprivation in monkeys. *Scientific*

American 207: 136-146

- Harlow, H.F. (1969) Age-mate or peer affectional system. *Advances in the Study of Behavior* 2: 333-383
- Hartline, P.H. (1971) Physiological basis for detection of sound and vibration in snakes. *Journal of Experimental Biology* 54: 349-371
- Hartung, J. (2003) Effects of transport on health of farm animals. *Veterinary Research Communications* 27 Suppl. 1: 525-527
- Hastie, G. D., Rosen, D. A. S. and Trites, A.W. (2006) The influence of depth on a breath-hold diver: Predicting the diving metabolism of Steller sea lions (*Eumetopias jubatus*) *Journal of Experimental Marine Biology and Ecology* 336 (2): 163-170.
- Hatt, J.-M. & Clauss, M. (2006) Feeding Asian and African elephants. *International Zoo Yearbook* 40:88-95.
- Hauser, M., Pearson, H. and Seelig, D. (2002) Ontogeny of tool use in cottontop tamarins, *Saguinus oedipus*: innate recognition of functionally relevant features. *Animal Behaviour* 64: 299-311.
- Heatwole, H. (1976) *Reptile Ecology*. University of Queensland Press, St. Lucia, Queensland, Australia
- Hediger, H. (1955) 'Animal Psychology in the circus', *Studies of the Psychology and Behaviour of Captive Animals in Zoos and Circuses* London: Butterworths Scientific Publications
- Hediger, H. (1964) *Wild animals in captivity*. Dover Publications, New York, USA
- Hemsworth, G. (1980) Mary Chipperfield and her horses at Blackpool Tower Circuses. *Stable Management* 16: 4-15
- Hemsworth, P.H. & Barnett, J.L. (2000) Human-animal interactions and animal stress. In: *The biology of animal stress* (eds. Moberg, G.P. & Mench, J.A.), pp. 309-335. CABI Publishing, Oxon, UK
- Herskin, M.S & Jensen, K. H. (2000) Effects of different degrees of social isolation on the behaviour of weaned piglets kept for experimental purposes. *Animal Welfare*. 9: 237-249
- Higley JD (2001) Individual differences in alcohol-induced aggression: a non-human primate model. *Alcohol Research and Health* 25(1): 12-19.
- Hittmair, K. M. & Vielgrader, H. D. (2000) Radiographic diagnosis of lameness in African elephants (*Loxodonta africana*). *Veterinary Radiology & Ultrasound*. 41(6):511-515
- Hogan, E.S., Houpt, K.A. & Sweeney, K. (1988) The effect of enclosure size on social interactions and daily activity patterns of the captive Asiatic wild horse (*Equus przewalskii*). *Applied Animal Behaviour Science* 21: 147-168

- Holekamp, K. E. and Smale, L. (1998) Dispersal status influences hormones and behavior in the male spotted hyena. *Hormones and Behavior* 33 (3): 205-216.
- Höllerl, S., Stimm, B., Hummel, J. & Clauss, M. (2005) Browse provision for captive herbivores: design and management of a browse plantation. Fourth European Zoo Nutrition Conference, 20-23 January 2005, Leipzig, Germany. Available online:
<http://www.eznc.org/primosite/show.do?ctx=7795,34509&anav=34517>
- Hosey, G.R. (2000) Zoo animals and their human audiences: what is the visitor effect? *Animal Welfare* 9: 343-357
- Houck R (1993). Veterinary care of performing elephants. Pp. 453-454 in Fowler ME (Ed.): *Zoo and Wild Animal Medicine: Current Therapy*. 3rd Edition. Saunders Ltd.
- Huchzermeyer, F. W. (2002) Diseases of Farmed Crocodiles and Ostriches. *Revue scientifique et technique (International Office of Epizootics)* 21(2) 265-276.
- Hummel, J., Pfeffer, E., Nørgaard, C. Johanson, K., Clauss, M. and Nogge, G. (2006) Energy Supply of the Okapi in Captivity: Intake and Digestion Trials. *Zoo Biology* 25: 303–316
- Hutchins, M. & Kreger, M. D. (2006) Rhinoceros behaviour: implications for captive management and conservation. *International Zoo Yearbook* 40:150-173.
- Jago, J.G., Harcourt, R.G. and Matthews, L.R. (1997) The effect of road-type and distance transported on behaviour, physiology and carcass quality of farmed red deer (*Cervus elaphus*). *Applied Animal Behaviour Science* 51: 129 – 141
- Jago, J.G., Hargreaves, A.L., Harcourt, R.G. and Matthews, L.R. (1996) Risk factors associated with bruising in red deer at a commercial slaughter plant. *Meat Science* 44: 181 – 191
- Jensen, Hahn & Dudek 1979 cited in Shoshani, J., Kupsky, W.J. & Marchant, G.H. (2006) Elephant brain Part I: gross morphology, functions, comparative anatomy, and evolution. *Brain Research Bulletin* 70: 124-157
- Jeppesen, L.L. & Pedersen, V. (1991) Effects of whole-year nest boxes on cortisol, circulating leucocytes, exploration and agonistic behaviour in silver foxes. *Behavioural Processes* 25: 171-177
- Johnson LA (1997). Zoo guidelines for keeping bears in captivity. AZA – American Zoo and Aquarium Association
- Johnson, D.L. (1980) Problems in the Land Vertebrate Zoogeography of Certain Islands and the Swimming Powers of Elephants. *Journal of Biogeography* 7(4):383-398.
- Johnson, W. (1990) *The rose-tinted menagerie*. Heretic Books Ltd., London, UK
- Kiley-Worthington, M. (1990). The training of circus animals. In: *Animal Training: Proceedings of a Universities Federation for Animal Welfare Symposium*, 26-

27 September 1989, pp. 65-81. UFAW, Hertfordshire, England

- Kiley-Worthington, Marthe, *Animals in Circuses and Zoos: Chiron's World?* Essex, England: Little Eco-Farms Publishing (1990)
- King, N.E. & Mellen, J.D. (1994) The effects of early experience on adult copulatory behaviour in zoo-born chimpanzees (*Pan troglodytes*). *Zoo Biology* 13: 51-59
- Kingdon J (1997). *The Kingdon Field Guide to African Mammals*. Academic Press, London
- Kirkden, R.D., and Broom, D.M., 2002, Individual differences in the causes of stereotypy in captive elephants, Dept of Clinical Veterinary Medicine, University of Cambridge, CB3 0ES. Unpublished study of group of elephants in circus holding facility in the UK.
- Klingel 1969a, b, 1972, Rudnai 1974 and Smuts 1974 cited in Linklater, W.L. (2000) Adaptive explanation in socio-ecology: lessons from the Equidae. *Biological Reviews* 75: 1-20
- Knight, J. (2001) Animal data jeopardized by life behind bars. *Nature* 412: 669
- Knowles, T. G. (1998) A review of the road transport of slaughter sheep. *Veterinary Record* 143: 212-219
- Knowles, T. G. (1999) A review of the road transport of cattle. *The Veterinary Record* 144: 197-201
- Koehl D (2005). Elephants infected with Rabies virus (On-line), Absolut Elephant, Copyright © 1995-2005. Accessed 11 November 2005 at <<http://www.elephant.se/rabies.php>>
- Kojola, I. (1990) Intraherd Spacing Behaviour of Female Reindeer: Effects of Kinship, Age and Habituation. *Applied Animal Behaviour Science* 26: 41 – 47
- Krawczel PD, Friend TH & Windom A (2005). Stereotypic behavior of circus tigers: Effects of performance. *Applied Animal Behaviour Science* 95: 189-198
- Kreeger, T.J., Pereira, D.L., Callahan, M. et al. (1996) Activity patterns of gray wolves housed in small vs large enclosures. *Zoo Biology* 15 (4): 395-401
- Kuhar, C.W., Bettinger, T.L., Sironen, A.L., Shaw, J.H. & Lasley, B.L. (2003) Factors affecting reproduction in zoo-housed Geoffroy's tamarins (*Saguinus geoffroyi*). *Zoo Biology* 22: 545-559
- Kuntze, A. (1989) Work-related illness: Hernia perinealis, Bursitis praepatellaris and Tyloma olecrani in female circus elephants (*Elephas maximus*). *Verh. Ber. Erkr. Zootiere* 31: 185-187
- Kurt, F. & Hartl, G.B. (1995) Asian elephants (*Elephas maximus*) in captivity – a challenge for zoo biological research. In: *Research and captive propagation* (eds Gansloßer, U., Hodges, J.K. & Kaumanns, W.), pp. 310-326. Finlander Verlag, Furth

- Kurt, F. & Khyne U Mar. (1996) Neonate mortality in captive Asian elephant (*Elephas maximus*). *Zeitschrift für Säugetierkunde* 61: 155-164
- Kurt, F. (1995) The preservation of Asian elephants in human care – a comparison between the different keeping systems in South Asia and Europe. *Animal Research and Development* 41: 38-60
- Kurt, F. (2006) Die Geschichte der Haltung von Elefanten in Menschenobhut [History of management in captive elephants]. *Zeitschrift des Kölner Zoo* 2: 59-74
- Laurie, A. (1982) Behavioural ecology of the Greater one-horned rhinoceros (*Rhinoceros unicornis*) *Journal of Zoology, London* (196: 307-341).
- Leuthold, W. (1977) Spatial organization and strategy of habitat utilization of elephants in Tsavo National Park, Kenya. *Zeitschrift für Säugetierkunde* 42: 358-379
- Lewis, E.R. & Narins, P.M. (1985) Do frogs communicate with seismic signals? *Science* 227: 187-189
- Lewison, R. L. & Carter, J. (2004) Exploring behavior of an unusual megaherbivore: a spatially explicit foraging model of the hippopotamus. *Ecological Modelling* 171 (1-2): 127-138.
- Lindau, K.-H. (1970) Lameness in circus elephants – a result of training? *Verhandlungsberichte des 12 Internationalen Symposiums über die Erkrankungen der Zootiere*: 129-131
- Lindburg, D.G. & Fitch-Snyder, H. (1994) Use of behaviour to evaluate reproductive problems in captive mammals. *Zoo Biology* 13: 433-445
- Lyons, J., Young, R.J., and Deag, J.M., 'The Effects of Physical Characteristics of Environment and Feeding Regime on Behavior of Captive Felids', *Zoo Biology*, 16 71-93 (1997).
- Makwana, S.C. (1978) Field ecology and behaviour of the rhesus macaque (*Macaca mulatta*): I. Group composition, home range, roosting sites, and foraging routes in the Asarori Forest. *Primates* 19: 483-492
- Mallapur, A. & Chellam, R. (2002) Environmental influences on stereotypy and the activity budget of Indian leopards (*Panthera pardus*) in four zoos of Southern India. *Zoo Biology* 21: 585-595
- Mallapur, A. and Choudhury, B. C. (2003) Behavioral Abnormalities in Captive Nonhuman Primates Wildlife Institute of India, *Journal of Applied Animal Welfare Science*. 6(4):275-284.
- Mallapur, A., Qureshi, Q and Ravi Chellam (2002) Enclosure Design and Space Utilization by Indian Leopards (*Panthera pardus*) in Four Zoos in Southern India. *Journal of Applied Animal Welfare Science*. 5(2), 111–124
- Marriner, L.M. & Drickamer, L.C. (1994) Factors influencing stereotyped behavior of primates in a zoo. *Zoo Biology* 13: 267-275

- Martin, J. E. (2002) Early life experiences: activity levels and abnormal behaviours in resocialised chimpanzees. *Animal Welfare* 11: 419-436.
- Martínez, J., Segura, P., García, D., Aduriz, G., Ibabe, J.C., Peris, B. & Corpa, J.M. (2006) Septicaemia secondary to infection by *Corynebacterium macginleyi* in an Indian python (*Python molurus*). *Veterinary Journal* 172: 382-385
- Mason, G. J. and N. Latham, 'Can't stop, won't stop: Is stereotypy a reliable animal welfare indicator?', *Animal Welfare* 13: S57 – S 69. (2004).
- Mason, G., Clubb, R., Latham, N. & Vickery, S. (2006) Why and how should we use environmental enrichment to tackle stereotypic behaviour? *Applied Animal Behaviour Science* doi: 10.1016/j.applanim.2006.05.041
- Mason, G., (1991) 'Stereotypies: a critical review', *Animal Behaviour*, 41:1015-37
- Mason, G.J. (1991) Stereotypies and suffering. *Behavioural Processes* 25: 103-115
- Mason, G.J., Cooper, J. & Clarebrough, C. (2001) Frustrations of fur-farmed mink. *Nature* 410: 35-36
- McDonald, D. (2001) *The New Encyclopedia of Mammals*. Oxford University Press. Oxford. UK
- McGreevy, P. (2004) Equine behaviour – a guide for veterinarians and equine scientists. Saunders. 323-324
- Meehan, C.L., Garner, J.P. & Mench, J.A. (2004) Environmental enrichment and development of cage stereotypy in Orange-winged Amazon parrots (*Amazona amazonica*). *Developmental Psychobiology* 44: 209-218
- Meehan, C.L., Millam, J.R. and Mench. J. A. (2003) Foraging opportunity and increased physical complexity both prevent and reduce psychogenic feather plucking by young Amazon Parrots. *Applied Animal Behaviour Science*. 80: 71-85
- Mellen, J.D. (1991) Factors Influencing Reproductive Success in Small Captive Exotic Felids (*Felis* spp): A multiple regression analysis. *Zoo Biology*. 10: 95-110
- Michalak, K., Austin, C., Diesel, S., Bacon, J.M., Zimmerman, P. & Maslow, J.N. (1998) *Mycobacterium tuberculosis* infection as a zoonotic disease: transmission between humans and elephants. *Emerging Infectious Diseases* 4: 283-287
- Mitchell, G. and Gomber, J. (1976) Moving laboratory rhesus monkeys (*Macaca mulatta*) to unfamiliar home cages. *Primates* 17:543–547.
- Mittelmeier, R. A., Rylands, A. B. and Konstant, W. R. (1999) *Primates of the World: an introduction*. In: R. M. Nowak (Ed.) *Walker's Primates of the World*. The John Hopkins University Press. London.
- Moberg, G.P. (2000) Biological response to stress: implications for animal welfare. In: *The biology of animal stress* (eds. Moberg, G.P. & Mench, J.A.), pp. 1-21.

CABI Publishing, Oxon, UK

- Montané, J., Marco, I., Lúpez-Olvera, J., Manteca, X. and Lavin, S. (2002) Transport Stress in Roe Deer (*Capreolus capreolus*) effect of a short-acting antipsychotic. *Animal Welfare* 11: 405-417
- Montaudouina, B., Le Pape, G. (2005) Comparison Between 28 Zoological Parks: Stereotypic and Social Behaviours of Captive Brown Bears (*Ursus arctos*). *Applied Animal Behaviour Science*. 92. 129-141
- Montes, I., McLaren, G.W., Macdonald, D.W. & Mian, R. (2004) The effect of transport stress on neutrophil activation in wild badgers (*Meles meles*). *Animal Welfare* 13: 355-359
- Morgan, K.N. & Tromborg, C.T. (2006) Sources of stress in captivity. *Applied Animal Behaviour Science* doi: 10.1016/j.applanim.2006.05.032
- Morici, L. A., Elsey, R. M. and Lance, V. A. (1997) Effects of long-term corticosterone implants on growth and immune function in juvenile alligators, *Alligator mississippiensis*. *J Exp Zool*. 279(2):156-62. NSPCA (National Society for the Protection of Cruelty to Animals, South Africa) <http://www.nspca.co.za/Reptiles-in-captivity.htm>
- Moss, C.J. (2001) The demography of an African elephant (*Loxodonta africana*) population in Amboseli, Kenya. *Journal of Zoology* 255: 145-156
- Müller, P. (2004) 30 Jahre Internationales Tigerzuchtbuch in Leipzig [Thirty years International Tiger Studbook in Leipzig]. *Zoologische Garten* 74: 65-76
- Munson, L., Koehler, J.W., Wilkinson, J.E. and Miller, R.E. (1998). Vesicular and Ulcerative Dermatopathy Resembling Superficial Necrolytic Dermatitis in Captive Black Rhinoceroses (*Diceros bicornis*). *Veterinary Pathology* 35: 31-42.
- Myers, D.L., Zurbriggen, A., Lutz, H. & Pospischil, A. (1997) Distemper: not a new disease in lions and tigers. *Clinical and Diagnostic Laboratory Immunology* 4: 180-184
- Napolitano, F., de Rosa, G., Grasso, F., Pacelli, C. and Bordi, A. (2004) Influence of space allowance on the welfare of weaned buffalo (*Bubalus bubalis*) calves. *Livestock Production Science* 86: 117 – 124
- National Tuberculosis Working Group for Zoo and Wildlife Species (2003). Guidelines for the Control of Tuberculosis in Elephants. APHIS
- Né, S. & Nouet, J.-C. (2000) The condition of circus animals. The French Animal Rights League Foundation, LFDA, Paris, France
- Nevil, C. H. & Friend, T.H. (2003) The Behaviour of Circus Tigers during transport. *Applied Animal Behaviour Science*. 82: 329-337
- Nevill CH, Friend TH & Toscano MJ (2004). Survey of transport environments of circus tiger (*Panthera Tigris*) acts. *Journal of Zoo and Wildlife Medicine* 35:

- Nevill, C. H. and T.H. Friend (2006), 'A preliminary study on the effects of limited access to an exercise pen on stereotypic pacing in circus tigers', *Applied Animal Behaviour Science*, in press (hereafter Nevill et al (2006)).
- Nowak R (1997). *Walker's Mammals of the World*. Baltimore, Maryland: The Johns Hopkins University Press.
- Nowell K & Jackson P (1996). *Wild Cats – Status Survey and Conservation Action Plan*. IUCN/SSC Cat Specialist Group
- Nyhus, P.J., Tilson, R.L. & Tomlinson, J.L. (2003) Dangerous animals in captivity: ex situ tiger conflict and implications for private ownership of exotic animals. *Zoo Biology* 22: 573-586
- Odyuo, L.T., Jana, D. N. and Das, N. (1995) Maintenance behaviour of Murrah buffalo intensive management system. *Applied Animal Behaviour Science* 45: 293 - 299
- Owen, M.A., Swaisgood, R.R., Czekala, N.M., Steinman, K. & Lindburg, D.G. (2004) Monitoring stress in captive giant pandas (*Ailuropoda melanoleuca*): behavioral and hormonal responses to ambient noise. *Zoo Biology* 23: 147-164
- Owen, M.A., Swasgood, R.R., Czekala, N.M., Steinman, K. & Lindburg, D.G. (2004) Monitoring stress in captive giant pandas (*Ailuropoda melanoleuca*): behavioral and hormonal responses to ambient noise. *Zoo Biology* 23: 147-164
- Page, S. L. and Goodman, M. (2001) Catarrhine phylogeny: Noncoding DNA evidence for a diphyletic origin of the mangabeys and for a human-chimpanzee clade. *Molecular Phylogenetics and Evolution* 18 (1):14-25.
- Palmour, R. M., Mulligan, J., Howbert, J. J. and Ervin, F. (1997) Of monkeys and men: Vervets and the genetics of human-like behaviours. *American Journal of Human Genetics* 61 (3): 481-488.
- Palomares, F. & Caro, T.M. (1999) Interspecific killing among mammalian carnivores. *American Naturalist* 153: 492-508
- Parrot, R.F., Lloyd, D. M. & Brown, D. (1999) Transport Stress and Exercise Hyperthermia Recorded in Sheep by Radiotelemetry. *Animal Welfare*. 8: 27-34
- Pavlik I, Machackova M, Yayo Ayele W, Lamka J, Parmova I, Melicharek I, Hanzlikova M, Körmendy B, Nagy G, Cvetnic Z, Ocepek M & Lipiec M (2002). Incidence of bovine tuberculosis in wild and domestic animals other than cattle in six Central European countries during 1990-1999. *Veterinárni Medicína* 47(5): 122-131
- Penzhorn, B.L. and Novellie, P.A. (1991) Some behavioral traits of cape mountain zebras (*Equus zebra zebra*) and their implications for the management of a small conservation area. *Applied Animal Behaviour Science* 29 (1 – 4): 293 -

- Plowman, A. & Turner, I. (2001) A survey and database of browse use in British and Irish zoos. Second European Zoo Nutrition Conference, 6-9 April, Marwell Preservation Trust Sparsholt College, Hampshire, UK. Available online at: <http://www.eznc.org/primosite/show.do?ctx=7795,46604>
- Pollard, J. C. and Littlejohn, R. P. (1994) Behavioural effects of light conditions on red deer in a holding pen. *Applied Animal Behaviour Science* 41 (1-2): 127 – 134
- Pollard, J. C. and Littlejohn, R. P. (1998) Effects of winter housing, exercise and dietary treatments on the behaviour and welfare of red deer (*Cervus elaphus*) hinds. *Animal Welfare*. 7: 45-56
- Pollard, J.C. and Littlejohn, R.P. (1996) The effects of pen size on the behaviour of farmed red deer stags confined in yards. *Applied Animal Behaviour Science* 47 (3-4): 247-253
- Pollard, J.C., Littlejohn, R.P. and Suttie, J.M. (1993) Effects of isolation and mixing of social groups on heart rate and behaviour of red deer stags. *Applied Animal Behaviour Science* 38: 311-322
- Pollard, J.C., Littlejohn, R.P., Asher, G.W. et al. (2002) A comparison of biochemical and meat quality variables in red deer (*Cervus elaphus*) following either slaughter at pasture or killing at a deer slaughter plant. *Meat Science* 60: 85 – 94
- Pollmann, U. (2002) Pferdehaltung in Zirkus-und Schaustellerbetrieben [Horses in circus and showman businesses]. *Deutsche Tierärztliche Wochenschrift* 109: 126-129
- Potter, J.S. and Clauss, M. (2005) Mortality of Captive Giraffe (*Giraffa Camelopardalis*) Associated with Serous Fat Atrophy: A Review of Five Cases at Auckland Zoo. *Journal of Zoo and Wildlife Medicine*. 36 (2): 301 - 307
- Price, E.E. & Stoinski, T.S. (2006) Group size: determinants in the wild and implications for the captive housing of wild mammals in zoos. *Applied Animal Behaviour Science* doi: 10.1016/j.applanim.2006.05.021
- Price, E.O. (1999) Behavioral development in animals undergoing domestication. *Applied Animal Behaviour Science* 65: 245-271
- Price, O. (1984) Behavioral aspects of animal domestication. *Quarterly Review of Biology* 59: 1-32
- Quaid, U., Harris, M., Sherwin, C. & Harris, S. unpublished data
- Rabb, G.B. & Saunders, C.D. (2005) The future of zoos and aquariums: conservation and caring. *International Zoo Yearbook* 39: 1-26
- Rees, P. A. (2004) Low environmental temperature causes an increase in stereotypic behaviour in captive Asian elephants (*Elephas maximus*). *Journal of Thermal*

Biology. 20:37-43

- Reitschel, W. (2002) Haltung von Elefanten im Zoo und Zirkus [Keeping of elephants in zoo and circus]. *Deutsche Tierärztliche Wochenschrift* 109: 123-126
- Ross, S. R. (2006) Issues of choice and control in the behaviour of a pair of captive polar bears (*Ursus maritimus*). *Behavioural Processes*. 73 117-120
- Roth, H.H., Hoppe-Dominik, B., Mühlenberg, M., Steinhauer-Burkart, B. & Fischer, F. (2004) Distribution and status of the hippopotamids in the Ivory Coast. *African Zoology* 39: 211-224
- Ryan CP (1997). Tuberculosis in circus elephants. *Pulse* 39(1):8-9
- Sands, J. and Creel, S. (2004) Social dominance, aggression and faecal glucocorticoid levels in a wild population of wolves, *Canis lupus*. *Animal Behaviour* 67: 387-396
- Schmid, J. (1995) Keeping circus elephants temporarily in paddocks – the effects on their behaviour. *Animal Welfare* 4: 87-101
- Schmid, J. (1998) Hands Off, Hands On: Some aspects of keeping elephants. *International Zoo News* 45(8): 476-486.
- Schmid, J. (1998) Status and reproductive capacity of the Asian elephant in zoos and circuses in Europe. *International Zoo News* 45/6: 341-351
- Schmid, R., Doherr, M.G. & Steiger, A. (2006) The influence of the breeding method on the behaviour of adult African grey parrots (*Psittacus erithacus*). *Applied Animal Behaviour Science* 98: 293-307
- Schmidt, M. (1986) Elephants (Proboscidae). In: *Zoo and Wild Animal Medicine* (ed. Fowler, M. E.), pp. 883-923. W. B. Saunders Company, Philadelphia
- Schmidt, P.A. and Mech, L.D. (1997) Wolf pack size and food acquisition. *American Naturalist* 150 (4): 513-517
- Schrøder-Petersen, D.L. & Simonsen, H.B. (2001) Tail biting in pigs. *Veterinary Journal* 162: 196-210
- Schulze, W. (1986) Zur Haltung von Elefanten im Zirkus mit Berücksichtigung ihrer Minimalbedürfnisse [On the keeping of elephants in a circus with regard to their minimal environment]. *Praktische Tierarzt* 67: 809-811
- Schwarm, A., Ortmann, S., Hofer, H., Streich, W. J., Flach, E. J., Kuhne, R., Hummel, J., Castell, J. C., Clauss, M. (2006) Digestion studies in captive Hippopotamidae: a group of large ungulates with an unusually low metabolic rate. *Journal of Animal Physiology and Animal Nutrition* 90 (7-8): 300-308.
- Toscano, M.J., T.H. Friend, and C.H. Nevill, 'Environmental Conditions and Body Temperature of Circus Elephants Transported During Relatively High and Low Temperature Conditions', *Journal of the Elephant Managers Association*, 12 (3), 115-49 (2001)

- Shepherdson, D. J., Carlstead, K. C. and Wielebnowski, N. (2004) Cross-institutional assessment of stress responses in zoo animals using longitudinal monitoring of faecal corticoids and behaviour. *Animal Welfare* 13: S105-S113 Suppl. S.
- Shoemaker AH, Maruska EJ & Rockwell R (1997). Minimum Husbandry Guidelines for Mammals: Large Felids. American Association of Zoo and Aquariums
- Siemoneit-Barum, G. (1995) Zur Praxis von Dresser und Tierhaltung im Zirkus. [The practice of training and animal husbandry in circuses]. *Deutsche Tierärztliche Wochenschrift* 95: 77-79
- Speer, N. C., Slack, G. & Troyer, E (2001) Economic Factors Associated with Livestock Transportation. *Journal of Animal Science*. 79: (E-suppl.) E166-E170
- Stewart, C. B., and Disotell, T. R. (1998) Primate evolution – in and out of Africa. *Current Biology* 8:R582-R588.
- Stoskopf, M.K. (1983) The physiological effects of psychological stress. *Zoo Biology* 2: 179-190
- Stratman, M. R., Alden, C. D., Pelton, M. R., Sunquist, M.E. (2001a) Long Distance Movement of a Florida Black Bear in the Southeastern Coastal plain. *Ursus*. 12:55–58
- Stratman, M. R., Alden, C. D., Pelton, M. R., Sunquist, M.E. (2001b) Habitat use by American Black Bears in the Sandhills of Florida. *Ursus* 12:109–114
- Stull, C. L. (1999) Responses of Horses to Trailer Design, Duration, and Floor Area During Commercial Transportation to Slaughter. *Journal of Animal Science* 77:2925-2933
- Stull, C. L., Spier, S.J., Aldridge, B.M., Blanchard, M & Stott, J.L. (2004). Immunological response to long term transport stress in mature horses and effects of adaptogenic dietary supplementation as an immunomodulator. *Equine Veterinary Journal*. 36(7)583-589
- Stull, C.L. & Rodiek, A. V. (2000) Physiological responses of horses to 24 hours of transportation using a commercial van during summer conditions. *Journal of Animal Science*. 78: 1458-1466
- Sukumar, R. (1992) *The Asian elephant: ecology and management*. Cambridge University Press, Cambridge, UK
- Sukumar, R. (2003) *The living elephants – evolutionary ecology, behaviour, and conservation*. Oxford University Press, New York, USA
- Sukumar, R. (2006) A brief review of the status, distribution and biology of wild Asian elephants. *International Zoo Yearbook* 40: 1-8
- Suttie, J.M. (1985) Social dominance in farmed red deer stags. *Applied Animal Behaviour Science*. 14: 191 - 199
- Swanson, W.F., Johnson, W.E., Cambre, R.C., Citino, S.B., Ougley, K.B., Brousset,

- D.M., Morals, R.N., Moreira, N., O'Brien, S.J. & Wildt, D.E. (2003) Reproductive status of endemic felid species in Latin American zoos and implications for ex situ conservation. *Zoo Biology* 22: 421-441
- Tarou, L.R., Bashaw, M.J. and Maple, T.L. (2000). Social Attachment in Giraffe: Response to Social Separation. *Zoo Biology* 19: 41-51
- Tarou, L.R., Meredith, M.J., Bashaw, J. and Maple, T.L. (2003) Failure of a Chemical Spray to Significantly Reduce Stereotypic Licking in a Captive Giraffe. *Zoo Biology* 22:601–607
- Taylor, V.J. & Poole, T.B. (1998) Captive breeding and infant mortality in Asian elephant: a comparison between twenty western zoos and three eastern elephant centers. *Zoo Biology* 17: 311-332
- Tefera, M. (2004) Observations on the clinical examination of the camel (*Camelus dromedarius*) in the field. *Tropical Animal Health and Production* 36 (5): 435-449
- Terio, K. A., Marker, L., Munson, L. (2004) Evidence for Chronic Stress in Captive but not Free-ranging cheetahs (*Acinonyx jubatus*) based on adrenal morphology and function. *Journal of Wildlife Diseases*. 40 (2) 250-266
- Terio, K.A. & Munson, L. (2000) Gastritis in cheetahs and relatedness to adrenal function. In: *Felid Taxon Advisory Group Action Plan* (eds. Pukazhenti, B., Wildt, D. & Mellen, J.), p. 36. American Zoo and Aquarium Association, Wheeling, Virginia, USA
- Thompson, V.D. (1989) Behavioral response of 12 ungulate species in captivity to the presence of humans. *Zoo Biology* 8: 275-297
- Toscano, M.J, Friend, T.H. & Nevill, C.H. (2001) Environmental conditions and body temperature of circus elephants transported during relatively high and low temperature conditions. *Journal of the Elephant Managers Association* 12: 115-149
- Tripaldi, C., De Rosa, G., Grasso, F. et al. (2004) Housing system and welfare of buffalo (*Bubalus bubalis*) cows. *Animal Science* 78: 477 – 483
- Trunkfield, H. R. & Broom, D. M. (1990) The welfare of calves during handling and transport. *Applied Animal Behaviour Science* 28: 135-152
- Trut, L.N. (1999) Early canid domestication: the farm-fox experiment. *American Scientist* 87: 160-169
- Trut, L.N., Plyusnina, I.Z. & Oskina, I.N. (2004) An experiment on fox domestication and debatable issues of evolution of the dog. *Russian Journal of Genetics* 40: 644-655
- Turner, J. W., Tolson, P. and Hamad, N. (2002) Remote assessment of stress in white rhinoceros (*Ceratotherium simum*) and black rhinoceros (*Diceros bicornis*) by measurement of adrenal steroids in feces. *Journal of Zoo and Wildlife Medicine* 33 (3): 214-221.

- Vaarst, M., Hindhede, J. & Enevoldsen, C. (1998) Sole disorders in conventionally managed and organic dairy herds using different housing systems. *Journal of Dairy Research* 65: 175-186
- van der Harst, J. E. (2003) Tools to measure and improve welfare of laboratory rats: reward-related behaviour and environmental enrichment. Available online: <http://igitur-archive.library.uu.nl/dissertations/2003-1022-143851/full.pdf>
- van der Jeugd, H.P. & Prins, H.H.T. (2000) Movements and group structure of giraffe (*Giraffa camelopardalis*) in Lake Manyara National Park, Tanzania. *Journal of Zoology* 251: 15-21
- Veasey, J. (2006) Concepts in the care and welfare of captive elephants. *International Zoo Yearbook*. 40:63-79
- Veasey, J.S., Waran, N.K. & Young, R.J. (1996) On comparing the behaviour of zoo housed animals with wild conspecifics as a welfare indicator, using the giraffe (*Giraffa camelopardalis*) as a model. *Animal Welfare* 5: 139-153
- Vickery, S. & Mason, G. (2004) Stereotypic behavior in Asiatic black and Malayan sun bears. *Zoo Biology* 23: 409-430
- Vickery, S.S & Mason, G. J. (2003) Behavioral persistence in captive bears: implications for reintroduction. *Ursus* 14(1):35-43
- Waas, J.R., Ingram, J. R. and Matthews, L.R. (1997) Physiological responses of red deer (*Cervus elaphus*) to conditions experienced during road transport. *Physiology & Behaviour* 61: 931 – 938
- Wakefield, S., Winkler, A. & Zimmermann, W. (2003) EAZA Equid Tag Regional Collection Plan. In: EAZA Equid Taxon Advisory Group Regional Collection Plan 2003 (eds. Winkler, A., Rademacher, U. & Zimmermann, W.). European Association of Zoos and Aquaria, Druckstudio Rhein-Ruhr, Duisberg, Germany
- Warriss, P. D. (1996) The welfare of animals during transport. *The Veterinary Annual*, Vol 36, 73-85
- Warriss, P. D. (1998) The welfare of slaughter pigs during transport. *Animal Welfare* 1998, 7: 365-381
- Warriss, P. D. (2004) The transport of animals: a long way to go. *The Veterinary Journal* 168: 213-214.
- Webster, J. (2005). *Animal Welfare: Limping Towards Eden*. UFAW Animal Welfare Series. Blackwell publishing.
- Wechsler, B. (1992) Stereotypies and Attentiveness to noval stimuli: a test in polar bears. *Applied Animal Behaviour Science*. 33 381- 388
- Weissengruber, G. E., Fuss, F. K., Egger, G., Stanek, G., Hittmair, K.M. & Forstenpointner, G. (2006) The elephant knee joint: morphological and biomechanical considerations. *Journal of Anatomy*. 208:59

- Weller, S.H. & Bennett, C.L. (2001) Twenty-four hour activity budget and patterns of behavior in captive ocelots (*Leopardus pardalis*). *Applied Animal Behaviour Science* 71: 67-79
- Wells, A., Terio, K.A., Ziccardi, M.H. & Munson, L. (2004) The Stress Response to Environmental Change in Captive Cheetahs (*Acinonyx jubantus*). *Journal of Zoo and Wildlife Medicine*. 35(1) 8-14
- Wells, A., Terio, K.A., Ziccardi, M.H. & Munson, L. (2004) The Stress Response to Environmental Change in Captive Cheetahs (*Acinonyx jubantus*). *Journal of Zoo and Wildlife Medicine*. 35(1) 8-14
- Whittington, C.J. and Chamove, C.J. (1995) Effects of visual cover on farmed red deer behavior. *Applied Animal Behaviour Science* 45 (3-4): 309-314
- Wielebnowski, N.C., Fletchall, N., Carlstead, K., Busso, J.M., Brown, J.L. (2002) Non-invasive Assessment of Adrenal Activity Associated with Husbandry and Behavioural Factors in the North American Clouded Leopard Population. *Zoo Biology*. 21: 77-98
- Wienker, W.R. (1986) Giraffe squeeze cage procedure. *Zoo Biology* 5 (4): 371-377
- Wiese, R.J. & Willis, K. (2004) Calculation of longevity and life expectancy in captive elephants. *Zoo Biology* 23: 365-373
- Wiesner, H. (1986) Probleme bei der Haltung von Zirkustieren [Problems of circus animals]. *Tieraerztliche Umschau* 41: 753-755
- Wildman, D. E., Uddin, M., Liu, G. Z., Grossman, L. I. and Goodman, M. (2003) Implications of natural selection in shaping 99.4% nonsynonymous DNA identity between humans and chimpanzees: Enlarging genus *Homo*. *PNAS* 100 (12): 7181-7188.
- Wildt, D.E., Brown, J.L., Bush, M., Barone, M.A., Cooper, K.A., Grisham, J. & Howard, J.G. (1993) Reproductive status of cheetahs (*Acinonyx jubatus*) in North American zoos: the benefits of physiological surveys for strategic planning. *Zoo Biology* 12: 45-80
- Williams, J.L. & Friend, T.H. (2003) Behavior of circus elephants during transport. *Journal of Elephant Managers Association* 14: 8-11
- Wilson, M. L., Bashaw, M. J., Fountain, K., Kieschnick, S., Maple, T. L. (2006) Nocturnal behavior in a group of female African elephants. *Zoo Biology* 25 (3): 173-186.
- Wilson, M.L., Bloomsmith, M.A. & Maple, T.L. (2004) Stereotypic swaying and serum cortisol concentrations in three captive African elephants (*Loxodonta africana*). *Animal Welfare* 13: 39-43
- Wolfensohn, S. E. (1997). Brief review of the scientific studies on the welfare implications of transporting primates. *Laboratory Animals* 31: 303–305.
- Wotton, S. B. & Hewitt, L. (1999) Transportation of ostriches – a review. *The*

Veterinary Record 145: 725-731

Würbel, H. (2001) Ideal homes? Housing effects on rodent brain and behaviour. Trends in Neurosciences 24: 207-211

Young, B.A. & Morain, M. (2002) The use of ground-borne vibrations for prey localization in the Saharan sand vipers (Cerastes). Journal of Experimental Biology 205: 661-665

Young, R.J. (2003) Environmental enrichment for captive animals. UFAW Animal Welfare Series. Blackwell Science Ltd, Oxford, UK

Zschokke, S. (2002) Distorted sex ratio at birth in the captive pygmy hippopotamus, Hexaprotodon liberiensis. Journal of Mammalogy 83 (3): 674-681.

Zwart, P. (2001) Assessment of the husbandry problems of reptiles on the basis of pathophysiological findings: a review. Veterinary Quarterly 23: 140-147