

does the public have an accurate understanding of commercial egg production?), I think the mechanisms that she envisioned are present in a broad sense and provide for change that can improve animal welfare.

Altogether, I found the book genuinely interesting and well organised into a comprehensive thesis with supporting positions constructed in a logical and thorough manner. On some points I did find myself questioning whether some of the opinions she used to support her argument were overstated. For instance, comments by legislators in support of several government actions and/or bills could be easily taken out of context and I was concerned that she was using an emotional tangent by an individual as supportive of widespread acknowledgement by that body, ie the Senate, for the resolution. Nonetheless, that these arguments and thought processes were stated in actual legislative debate and/or judicial opinions supports her notion that the concepts contained within her text are not so far from the public's understanding and expectations for animal welfare. Indeed, a force or action is needed to bring these understandings from the periphery and onto centre stage where they can be adequately addressed. In this regard, Smith has taken concrete steps towards this end and hopefully, meaningful and productive discourse will result.

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Zoo Animals: Behaviour, Management and Welfare, Second Edition

G Hosey, V Melfi and S Pankhurst (2013). Published by Oxford University Press, Great Clarendon Street, Oxford OX2 6DP, UK. 696 pages Paperback (ISBN 978-0-19-969352-8). Price £32.99.

This book has three co-authors. Two are university professors while the other is a zoo keeper and conservationist. This provides a combination of both a scientific and practical perspective of the problems arising in modern accredited zoos with high standards of animal welfare.

Chapter 1 explains that accredited zoos are complicated organisms, relying upon multiple specialists to function well. As such, accredited zoos declare four key tasks: conservation, education, research and recreation. The accredited zoos are scientifically, governmentally regulated institutions; with their best scientific research published in peer-reviewed journals such as *Zoo Biology*, *Applied Animal Behaviour Science* and *Animal Welfare*.

Why do people visit zoos? Visitors want to educate their children (36%), to have a fun day (26%), to see animals (25%) and to communicate with the wild (11%). So, all the four primary tasks of zoos are equally important: to preserve wildlife, to investigate, to educate, to entertain. The emotional aspect is the basic difference between zoo and museum visitors. The unique opportunity of zoos is to make it possible for people to communicate with nature

using all of their senses. At the same time, zoos allow people to remain safe from dangerous animals. The development of good, modern zoos is driven by public reaction to poor enclosures and poor conditions of animal keeping.

Chapter 2 tells the history of zoos from ancient times to modern day, showing changes in purpose and management, with examples of particular animals, zoos, enclosures, directors and curators. The reader can follow the evolution of zoos from tsar menageries and barren cages to Hagenbeck-type panoramic enclosures, without bars. This coincides with a transition from taxonomic collections to compositions, representing fauna from regions of the world, such as Australia or the Arctic. However, zoo development was not always smooth. The Hygiene Era of 1920s, had characteristically sterile compounds made from concrete, steel and glass and painfully high degrees of reverberation and can still be found in many zoos today.

Chapter 3 is devoted to legislation at national and international level. One of most important international laws is the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), regulating trade for approximately 5,000 animal and 25,000 plant species. Another two are the 1992 Convention on Biological Diversity (CBD) for measures for conservation of components of biological diversity for sustainable diversity and the International Air Transport Association (IATA) Live Animal Regulations (LARs) intended to ensure that live animals are transported safely, legally and with good standards of welfare. Membership of these international associations is voluntary, and hundreds of airlines are already affiliated. Also, many international associations, programmes and laws regulating health, disease and reintroduction issues are listed in the Chapter 3.

Chapter 4 focuses on animal behaviour. The role of the ethogram is explored, supported by photos and drawings to facilitate the identification of different types of behaviour. Behavioural diversity in captivity reflects the efforts of keepers to improve the zoo environment and welfare of animals. Different types of animal learning and training, the role of motivation and formation of abnormal behaviours are considered, in relation to animal personality and taxa.

The authors discuss in detail, why certain taxa are worse than others as regards to stereotypy and other behavioural abnormalities, and strongly suggest behavioural observations in the wild to help understand the reasons for these problems. The harmful effects of keeping predator and prey species in neighbouring enclosures is explored, as even smell of predator faeces can result in anxiety in certain prey species, such as small monkeys. Also, changes in either physical or social environment can have complex, taxon- and person-dependent effects on zoo animals, ranging from primates to elephants.

Chapter 5 is on individual identification and record-keeping systems. Individual markers are vital in conservation, research, breeding, monitoring of health and studbook keeping. Despite great variation in different types of tags, microchips, rings, wingmarks and flipper bands, their relia-

bility and safety remains a worry. Record-keeping of life histories, demography and biometrics as well as DNA-sampling deserve strong attention and have great value internationally. The chapter reviews the scope and power of a few international information systems of zoos: ISIS, ARKS and SPARKS, MedARKS and ZIMS.

Chapter 6 deals with housing and husbandry. This involves the comfort of animals, visitors and keepers. Comfort of animals is achieved via zoo practices that are geared towards animal welfare, providing maximum opportunity for natural behaviours to be expressed. Similarly, visitors are keen to see naturalistic enclosures containing large, active animals with young. Thus, breeding animals inside zoos would be the optimal solution. Also, free-ranging animals outside enclosures attract much attention as do opportunities to observe feeding and pet the animals.

For keepers, enclosures should be easy to access, easy to clean and easy and safe to manipulate animals. The chapter also contains plenty of great advice concerning the design of enclosures as regards the use plants, the internet, videos, hidden constructions, scattered food and electric barriers. Many advanced zoos teach the public how to care for the environment, for example, how to separate their litter, the use of solar energy, minimising packaging on products and recycling.

Chapter 7 focuses on animal welfare: the central focus of modern zoos. Welfare depends on animal individuality and on the species. There are a few standardised criteria for estimating animal welfare, from poor to good.

Chapter 8 is concerned with environment enrichment and different types are considered in detail: food-based, timetable-based, physical, sensory, social and cognitive.

Chapter 9 deals with the role of conservation in zoos. One of the major principles of zoo conservation is minimising the taking of animals from the wild. In advanced zoo practice, 90% of animals are born in captivity. Thereby meaning the entire zoo community faces the problem of dealing with, in effect, small population management. This involves multidisciplinary approaches, combining knowledge gained from reproductive biology, ecology, behaviour, veterinary medicine and nutrition.

The book explores the problems of sex determination of zoo animals and the case of the Komodo dragon (*Varanus komodoensis*) is considered. Many reproductive technologies are currently being used in zoos, such as in vitro fertilisation, embryo transfer, and artificial insemination.

On the whole, the world zoo community works to create self-sustaining animal populations in captivity. No one single zoo is capable of supporting a captive population without international exchanges with other zoos. Specialized Taxon Advisory Groups (TAGs) manage captive management programmes on such an international level. For example, for parrots, EAZA already co-ordinates captive management programmes for a few threatened or endangered species and keeps five international studbooks. At the same time, regional collection plans (RCPs) identify what species should be managed and kept in particular zoo collections.

Chapter 10 discusses conservation, one of the major goals of accredited zoos. It outlines the necessity of conservation of rare species and the role of captive populations in support of biodiversity. The chapter discusses, what species should be conserved and address the issue of reintroduction.

Chapter 11 is on animal health criteria and health management in zoo animals. Particular aspects are dentistry, quarantine, vaccination, pest and parasite control, foot care, prophylaxis of dangerous infections and diseases, pain therapy and anaesthesia, with provision of helpful websites and other resources.

Chapter 12 deals with feeding and nutrition. Particular aspects are taxa-specific digestion, diet, key nutritional components, bioavailability and food presentation.

Chapter 13 deals with the people in zoos: keepers, managers, researchers, volunteers, and visitors. The money visitors bring into zoos is a major source of revenue therefore it is crucial to know who these people are and what are their reasons for coming as well as ensuring they have an enjoyable and rewarding experience. The chapter looks in specific detail at human-animal interactions, socio-economical portraits of zoo visitors and how zoo visitors perceive the animals.

Chapter 14 is devoted to the importance and methodology of zoo research. New scientific discoveries concerning, breeding, welfare and health are presented. The participation of modern zoos in scientific research has been regulated by governmental legislation since 1999.

In short, *Zoo Animals: Behaviour, Management and Welfare* summarises the experiences of many zoos from around the world, some of which have existed for more than 200 years. As an employee at a scientific research department at Moscow Zoo, I happily recommend such a nice and helpful book.

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