

A SUSTAINABLE FUTURE FOR ZOOS AND THEIR ROLE IN WILDLIFE CONSERVATION

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"Tomorrow's ark: by invitation only"
Thomas E Lovejoy, 1980

ABSTRACT: The ever-accelerating loss of habitat and the subsequent increased rate of extinctions calls for a more proactive and coordinated response from the global conservation community, if the present level of biological diversity is to be maintained. In recent years zoos, as social institutions, have responded by changing cultures and attitudes and have, as a consequence, shifted institutional emphasis to a real commitment to conservation programmes worldwide. However, the success of conservation planning, of effective execution/implementation and of prioritisation, will ultimately depend on increased degrees of cooperation, and the adoption of a multidisciplinary approach to problem solving. As the rate of animal extinction accelerates, with over 11,000 described species classified as threatened with extinction, the need for cooperation among local, national and international conservation organisations, and between the conservation community and other organisations involved with aid, development, tourism and funding, becomes essential. The linking of in-situ and ex-situ conservation activities represents a major opportunity in the effort to conserve global biodiversity. Therefore, the need for captive populations of threatened species to be founded and managed according to sound scientific principles, and for zoos to develop species management programmes on a national, regional and international basis, is of paramount importance. However, in recent years, with the immense increase in leisure time, personal mobility, and a much wider choice of attractions for a day out, many zoos have experienced fallen attendance which, in turn, has affected their financial ability to improve the visitor experience and their capacity to contribute to conservation. With visitor/tourist revenue being essential to a zoo's financial viability, zoos may have to focus their marketing beyond 2000 on being 'visitor attractions' or 'conservation organisations'. This is a dilemma that has to be addressed. This paper presents an international perspective and sets out the strategy that the author would like to see adopted by the global zoo community. This is for the zoos and aquaria of the world, and their regional associations, to subscribe to in principle, and to implement in practice the tenet that their prime role is as conservation centers. It must thus be explicit that they strongly support the conservation of biodiversity. The text stresses the importance of a multidisciplinary approach, and provides examples of how the promotion of 'flagship species' has aided the conservation of some of the world's biodiversity hotspots, including by the establishment of 'Ecoparks'. Also, it highlights how zoos have the ability significantly to contribute to conservation and how this may be linked to revenue from tourism and other sources. Finally it argues that regional associations of zoos, such as the Australasian Regional Association of Zoological Parks and Aquaria (ARAZPA), can promote a broader partnership participation in wildlife conservation and protection of the natural environment. This would benefit threatened species and all those who share this planet with them.

Introduction

The theme of this 'Wildlife Tourism' convention, providing as it does an opportunity for people from many different disciplines to share expertise, compare insights and build communication channels and networks, is very much in keeping with my long-maintained belief that a multidisciplinary approach is an essential ingredient in the realisation of sustainable conservation goals (Mallinson, 1998).

This paper presents an international perspective and records the type of strategy that I should like to see adopted by the global zoo community. This is for the zoos and aquaria of the world, and their regional associations, to have subscribed to in both principle and practice the idea that their prime purpose in modern society is to be conservation centres; and thereby for them to have embraced the goals of supporting the conservation of biodiversity (see Rabb, 2000).

With species continuing to disappear at rates never before witnessed, and with increasing fragmentation and disturbance of wild habitats worldwide, the World Conservation Union's document "Caring for the Earth" (IUCN/UNEP/WWF, 1991), and the Species Survival Commission's (SSC) development of a global network for species in the wild (IUCN/SSC, 1991), both acknowledge the increasing importance of captive breeding programmes for reinforcing conservation efforts in the wild (Rabb and Sullivan, 1995). Also, even those who had been sceptical about the conservation value of ex-situ populations have now recognised that, at the very least, these programmes can 'buy time' for critically threatened species.

With the maintenance of viable populations of all species in the wild being the conservation goal of the World Conservation Union (IUCN/SSC, 1991), it is important for conservation managers and decision-makers to set priorities in order to achieve this. It is also important to acknowledge that as fragmentation of species and habitats increases, most wildlife in the future will be living in human modified environments. The threats to biodiversity are so diverse (e.g. encompassing climate change, invasive species, unsustainable use, disease, etc.) that it seems that ex-situ conservation activities will need to increase, to complement in-situ work (Conway, 1999). With habitat protection alone being insufficient to achieve the expressed goal of the 'World Conservation Strategy', the maintenance of biological diversity, the IUCN has acknowledged that the establishment of self-sustaining captive populations, and other supportive interventions, will be needed to avoid the loss of many species, especially those at 'high risk' in greatly reduced, fragmented and disturbed habitats (IUCN/SSC, 1987).

As Conway (1999) recorded, although everyone understands that the conservation of biodiversity is fundamental to the maintenance of healthy ecosystems, and to the stewardship of natural resources, everyone also knows that few decision-makers take this seriously and that not one nation on Earth has made preservation of its biological environment a budgetary priority. However, in spite of this lack of any meaningful governmental financial support, it was encouraging to note that the key results of the March 1999 IUCN/SSC's Workshop on 'Strategic Planning' included a consensus: 'that the extinction crisis and massive loss in biodiversity be universally adopted as a shared responsibility, and to result in action to reduce this loss of diversity within species, between species, and of ecosystems' (Barrato, 1999).

It is this shared responsibility, using the full range of human resources available, forging new alliances in support of in situ conservation programmes and getting the human balance right, that I wish to address in this presentation. In particular, to demonstrate how the international zoo community is increasingly and significantly contributing to the conservation of threatened species and to the sustainability of wildlife and their associated habitats.

World Zoo Conservation Strategy

The World Zoo Conservation Strategy (WZCS), was an initiative of the World Zoo Organisation (recently renamed the World Association of Zoos and Aquariums -WAZA), and SSC's Conservation Breeding Specialist Group (CBSG), and represents a blueprint for the role of the zoos and aquaria of the world in global conservation (IUDZG/CBSG/SSC, 1993). The document represents a significant landmark by highlighting how far zoos have progressed in recent years in developing partnerships in support of species conservation in situ/ex situ.

The primary aim of the WZCS document is to support the conservation of species, natural habitats and ecosystems, with the many aspects of zoo conservation outlined in the 'Strategy' intended to be complementary to, and not a substitute for, other areas of conservation activities. The Duke of Edinburgh's foreword to the WZCS recorded: 'It is a very important contribution to the whole concept of partnerships between zoos and conservation organizations in the task of conserving nature and the natural environment'; and concluded: 'I hope that the World Zoo Conservation Strategy will bring about cooperation and partnership between zoos all over the world that is so vital to the conservation of nature, and so help them to realise that potential' (Edinburgh, Duke of, 1993).

Zoos and public opinion

As the rate of animal extinction accelerates, and with over 11,000 described species classified as threatened with extinction (12% of known bird species; 20% of amphibians; 24% of mammals; 25% of reptiles and 30% of mainly freshwater fish; Hilton-Taylor, 2000) the need for the public to become more aware of this impending extinction crisis becomes urgent. The global conservation community also needs to be much more aware of how zoos can (and should) contribute to government and NGOs efforts for species and habitat survival (Mallinson, 1991, 1996).

Due to a 'deluge' of habitat destruction and impending extinction, during the past two decades zoos and aquariums have come to be seen as modern Noah's Arks. This provides a positive public image for the conservation role of zoos. However, given the rapidly increasing numbers of threatened species, combined with sobering appraisals of limited zoo space/capacity, the international zoo community has to ask whether zoos are having anything more than a minimal impact on the conservation of the world's biodiversity (Hutchins and Conway, 1995; Galbraith, 2000).

In recent years there has been an increasing recognition that conservation in the wild will not succeed unless it is directly linked in benefit terms to those who share or live alongside protected areas (Kock, 1993). A similar situation exists with respect to public support for zoos. Most people are increasingly removed from the realities of the wild situation. However, each year zoos and aquaria bring wild animals to hundreds of

millions of people, most of them city dwellers who have no other major contact with wildlife (Wheater, 1994; Rowan and Hoage, 1995; Conway, 1996).

The WZCS document highlights the large numbers of people visiting zoos worldwide, and the estimates provide important indications of the general potential conservation role of zoos. For example, in North America roughly 100 million people, almost 50% of the total population, visit zoos on an annual basis. Similar numbers are found in Europe and Japan, whereas in Australia and New Zealand an estimated 6 million people visit zoos annually. Zoos in urban areas in other parts of the world also have impressive visitor attendances (IUDZG/CBSG/SSC,1993).

In combining these estimates world-wide, over 1000 zoos in organised networks annually receive at least 600 million visitors, representing approximately 10% of the entire world population. This is a staggering statistic. However, regrettably, the zoo world still remains a grossly under-utilised resource for the conservation of endangered species, for the development of scientific knowledge and for increasing public awareness through environmental education programmes (Wheater, 1995).

A partnership approach

In recent years zoos, as social institutions, have responded well in changing cultures and attitudes and have, as a consequence, shifted institutional emphasis to a real commitment to conservation programmes worldwide. However, the success of conservation planning, effective execution/implementation and the setting up of priorities, will ultimately depend on increased degrees of cooperation, coordination and the adoption of a multidisciplinary approach. Within this process partnership links between 'in-country' and ex-situ conservation programmes are of critical importance (Mallinson, 1991; Feistner and Mallinson, 2000).

The Conservation Breeding Specialist Group (CBSG) is one of the largest of over 110 Specialist Groups comprising the Species Survival Commission (SSC), one of six IUCN Commissions, and plays a pivotal role in facilitating endangered species survival and conservation action. The initial aims of CBSG were to assist the scientific management and establishment of viable populations of threatened species, through captive propagation and the intensive management of small and fragmented populations in the wild. However, since CBSG's inception in 1979, it has evolved considerably and now increasingly serves as a catalyst and mediator between wildlife and captive conservation communities worldwide (Ellis and Seal, 1995).

By the adoption of multidisciplinary approaches and collaborations with other centres of expertise, CBSG has developed in its workshop process the tools to aid decision-making for species survival. These tools are based on small population and conservation biology, human demography and social learning, which are used to produce realistic management recommendations. The CBSG workshop process employing these tools include: the Conservation Assessment and Management Plan (CAMP), and the Population and Habitat Viability Assessment (PHVA). The Specialist Group bases its mission and activities on the development and implementation of scientifically sound processes, taking a leadership position in the conservation community based on cross-cultural, interdisciplinary and intersector partnerships (see Ellis, 2001).

The World Zoos Organisation's (=WAZA) "Zoo Future 2005" document well reflects this change of emphasis in the role of a modern zoo by stressing the importance

of zoos building cooperative linkages between in-situ and ex-situ conservation programmes. The Zoo Future Action Plan stressed the importance of zoo research for the management of captive populations, and also its relevance to the re-establishment and conservation management of wild populations. It also emphasised that in order to assume this expanded conservation role, zoos need to become part of a single conservation community in which their skills and resources contribute to the long-term viability of wildlife in natural habitats (WZO, 1995).

Interactive programmes

The expanding of zoos' roles beyond captive breeding, education and research and into field conservation is a welcome but relatively recent phenomenon, which has developed as zoos have begun to recognise the importance of managing metapopulations, and of linking captive breeding to conservation efforts for wild populations and their habitats (Hutchins and Conway, 1995; Durrell and Mallinson, 1998).

There is an increasing number of fine examples of the way that the global zoo community is aiding in-situ conservation programmes. The Wildlife Conservation Society (WCS), from its headquarters at the Bronx Zoo/Wildlife Conservation Park, is a world leader in the way it oversees more than 300 field projects in 52 countries; including being directly involved in more than 115 parks and reserves protecting about 61 million ha (Conway, 1999; Orensteen and Johnson, 2001). However, as Rabb (2000) records, few institutions are in a position to manage large natural areas by themselves, and the importance of involvement of local people in maintaining viable natural environments is increasingly recognised by those concerned with protected areas and wildlife conservation. Long-term commitments, akin to the relationships developed by WCS and the Durrell Wildlife Conservation Trust (the Trust) are, among others, cited as good examples of how zoos can effectively interactively collaborate with wildlife conservation programmes in situ (Conway, 1995; Rabb, 2000).

Examples of the Trust's interactive partnership approach in its support of in-situ conservation in 14 different countries through: a) partnership agreements; b) in-country conservation breeding programmes; c) field research; d) reintroduction, introduction and translocation; e) environmental education; f) training; and g) fundraising for in-situ projects; are recorded in Appendix 1. However, perhaps the finest example to date of the Trust's successful strategy of maintaining a long-term commitment to the conservation of endemic wildlife, has been demonstrated by the Trust's partnership activities with the Mauritian Wildlife Foundation (MWF).

In 1972 the Mauritius kestrel had a population of only four known wild individuals. By the end of 1999, their total population was estimated at 720, with a breeding population of about 200 pairs. Similarly, the population of the Mauritius pink pigeon fell as low as 10 birds in 1990. However, thanks to the success of the captive breeding programmes both in Mauritius at the government aviaries (named the Gerald Durrell Endemic Wildlife Sanctuary in 1995) and overseas (e.g. at the Trust), by 2000 there were more than 400 free-flying pink pigeons in the wild, including at least 90 breeding pairs. A third Mauritius endemic bird species, the echo parakeet, was known from a minimum of only eight wild birds in 1987. Fortunately, through captive breeding, supplementary feeding, and manipulation of their nesting biology, by 2000 there were estimated to be in excess of 120 individuals

The programme sponsored by the Trust for the removal in 1986 of non-indigenous rabbits from Round Island, situated 14 miles off the north coast of Mauritius, which was so expertly carried out by Don Merton of the New Zealand Department of Conservation, halted an ecological disaster and enabled a dying island to regenerate some of its endemic fauna and flora. In 1994, the Trust signed an accord with the government of Mauritius, MWF, Fauna and Flora International, and the Royal Botanic Gardens, Kew, to formulate a long-term cooperative venture. The accord represents an integral part of the conservation policies carried out by the Mauritius National Parks and Conservation Service and, as a consequence, has recently gained significant grants from the World Bank, the UNDP, and the Darwin Initiative scheme sponsored by the British Government.

In 1994 Mauritius designated its first National Park (6,574 ha), which resulted partly from the Trust's long-term involvement with the conservation programmes that it had aided over the previous 19 years, in particular, by promoting both the Mauritius kestrel and pink pigeon as 'flagship species' for biodiversity conservation. The term 'flagship species' is used to describe an animal that stands for or promotes conservation in a general regional sense (Mittermeier, 1986). Also, it is of significance to record that the Mauritius National Park's first director, Yousoof Mungroo was, in 1978, the first graduate of the Trust's International Training Centre (ITC) - see Appendix 1, item 6.

The Trust's long-term involvement in promoting the golden-headed lion tamarin in Brazil as a flagship species, and its support for a Landowners' Environmental Education Programme to make the community surrounding the Una Biological Reserve, Bahia, understand the importance of protecting the forest remaining around it has, by the programme's success, helped with the establishment of the Una Ecopark. The Ecopark is an ecotourism facility adjoining the Una Reserve that includes trails, a canopy walk approximately 100 m long and 20 m high above the ground, and a visitors' education centre. By having promoted the golden-headed lion tamarin as a flagship species, and funded field research projects and land purchase, this long-term support has well demonstrated how such activities have significantly aided the conservation of one of the world's biodiversity hotspots - Brazil's Atlantic Rainforest ecosystem (Mallinson, 2001).

Many of the regional zoo associations such as the American Zoo Association (AZA) (Hoellen, 1997), the European Association of Zoos and Aquaria (EAZA) (EAZA/WZO, 2000), and in this region the Australasian Regional Association of Zoological Parks and Aquaria (ARAZPA) (McAllister, 2000), play an increasingly important role in supporting in-situ conservation partnership programmes.

A new course for wildlife conservationists in zoos worldwide was charted by the Minnesota Zoo in 1990 by their 'adoption' of the Ujung Kulon National Park in Java, Indonesia (Tilson, 1995). The 'adopt-a-park' strategy, which provides direct financial, logistical and other support for protected areas, is gaining popularity. The Wildlife Conservation Society's relationship with Amboseli National Park in Kenya, and the Chicago Zoological Society's long-term support for the Brookfield Conservation Park in South Australia, represent fine examples of such partnership interactive support for in-situ conservation programmes (Parker, 1992; Hutchins and Conway, 1995). Similarly, the international zoo community's development of Fauna Interest Groups (FIGs) at global and regional levels for various faunal regions of interest, especially areas of high

biodiversity such as Brazil, Indonesia/Malaysia, Madagascar, Vietnam/Philippines and Zaire, have contributed significantly to conservation programmes in these regions.

Under the ARAZPA umbrella, regional zoos agreed to cooperate and fund captive breeding and reintroduction programmes for regional endangered species. ARAZPA institutions' involvement with wildlife agency Recovery Programmes, with 26 taxa native to Australia and New Zealand being managed as an integral part of the recovery effort, and with Recovery Programmes for 12 species involving release of captive-bred animals in the wild, represents an excellent example of how regional zoos can increasingly contribute to in-situ conservation programmes (CBSG/SSC/IUCN, 1997; Barlow et al., 1999; McAllister, 2000).

Zoos and Tourism

In 1983, the English Tourist Board set up a committee of enquiry to report on zoos, entitled 'Britain's Zoos, Marketing and Presentation -The Way Forward to Viability'. The report highlighted the results of consumer research showing that the majority of visitors came to a zoo for a day out and to treat the children, not because they were primarily attracted to the conservation and educational aspects of a zoo. It also recorded that many zoos had been slow to appreciate the needs and expectations of their visitors, at the time when the quality of tourist attractions were rising, and where competent marketing and financial planning is so essential. It also stressed that zoos must become more commercially viable and should include recreation as one of their advertised aims (see Montagu, 1983).

In more recent years, with the immense increase in leisure time, personal mobility, and a much wider choice of attractions for a day out, many zoos have experienced fallen attendance which, in turn, has affected their financial ability to improve the visitor experience and their capacity to contribute to conservation. With visitor/tourist revenue being essential to a zoo's financial viability, whether zoos should focus on marketing themselves beyond 2000 as 'visitor attractions' or 'conservation organisations', is a dilemma that has to be addressed.

During the course of 2001 an 'Environmental Management Symposium' took place at Aalborg Zoo, Denmark, and a 'Marketing Zoos Beyond 2000' conference was held in Tenerife. Both of these regional and international meetings encouraged the different disciplines involved to share data, and to inspire others to 'Think Green'. Also the theme of the Tenerife meeting, 'Conservation Through Commerce', focussed on the shift from global to local markets; and the importance of adhering to strict ethical and welfare standards (Julin, 2001; McGregor Reid, 2001).

However, it is of particular relevance to the theme of this wildlife tourism convention to relate how the Durrell Wildlife Conservation Trust, with its headquarters at the Jersey Zoo, interacts with Jersey Tourism, in order to maximize the benefits of tourism to aid wildlife conservation, tourists, operators and society as a whole.

One half of the £4 million annual revenue the Trust requires to meet its mission of 'saving species from extinction' is earned from visitors to the Jersey Zoo. This vital trading income consists of admission fees plus visitor spending in the Zoo shop and a share of profits from the catering facility at the Zoo's Café. The health and well-being of the Trust is therefore directly dependent on the quantity and quality of leisure visitors to the island of Jersey. One of our most important conservation partners is therefore Jersey

Tourism, the government department responsible for marketing Jersey to the UK, Europe and the rest of the world as a travel destination.

There is no doubt that Gerald Durrell's best selling books describing Jersey Zoo helped to put Jersey 'on the map' just as his stories of an enchanted childhood in Corfu generated a tourism market for that Mediterranean island. Many visitors select Jersey for their holiday in order to visit Jersey Zoo and 57% of those who visit the island decide to visit the Zoo before leaving home. But Jersey is a travel destination in transition, from a traditional two week family bucket and spade holiday, to an upmarket short-break holiday destination for empty-nesters and childless young professionals. Already we can see that there are many fewer visitors to Jersey and to Jersey Zoo, but each visitor is capable of spending a greater sum per visiting day.

When Jersey Tourism realized the challenge ahead, the Executive Director looked to Jersey Zoo for help. The Trust's Development Director serves on a tourist industry forum, the Tourism Advisory Group. Along with representatives from airlines, ferries, hotel owners, tour operators and Chamber of Commerce retailers, she works with Jersey Tourism staff to create public/private tourism products, support marketing initiatives and raise the profile of Jersey on and off the island. Our Development Director also founded and chairs the Jersey Attractions Group, a consortium of the largest and most unique of the attractions on the island. Once these attractions competed against each other, but they now collaborate to insure universally high standards in the operation of the attractions and to encourage visitors to enjoy their Jersey stay more fully by seeing several of the attractions during a short break stay.

On behalf of Jersey Tourism the Trust has created flora and fauna on island tours that (surprisingly!) include a visit to the Zoo as well as coastal walks, bird watching and a visit to our world-renowned 'Eric Young Orchid Foundation'. In the interest of preserving a visitor market for Jersey AND protecting the Trust's ability to pursue its wildlife conservation mission, we are working in partnership with government and private enterprise representatives to develop and market a green tourism products on our island home.

Vision for the future

The role of zoos beyond home-based captive breeding, research and education into field conservation represents a welcome recent event, which has developed as zoos have begun to recognise the importance of managing metapopulations and linking captive breeding to conservation efforts for wild populations of threatened taxa and their habitats (Durrell and Mallinson, 1998).

In balancing ex-situ expertise with in-situ partnership endeavours, and reviewing a sustainable future for zoos and their role in wildlife conservation, it is important for the global zoo community to recognise that if long-term conservation efforts are to succeed 'in-country', there must be local partnership involvement.

In this respect, it has been shown that conservation partnerships involving zoo personnel, field biologists, educators, conservationists and administrators, that have integrated task-oriented teams of government and non-governmental personnel, specialists and non-specialists, have successfully promoted species and habitat recovery efforts, as well as helping to sustain wildlife/habitat resources. Also, it has been found that partnership agreements can mobilise resources to aid conservation efforts and lever

change on behalf of, and with the partnership of, local people (Mallinson and Hartley, 1997; Kleiman and Mallinson, 1998).

It is these types of multidisciplinary partnership approaches, and getting the human balance right, that I consider it vital for people working to conserve the world's wildlife heritage to adopt. This is particularly so if we are going to build the type of communication channels and networks needed between the conservation community, and other organisations involved with aid, development, tourism and funding that are all so essential for the future.

With regards to a vision for the future, it is important for the zoos and aquaria of the world, and their regional associations, to subscribe to in principle, and to implement in practise the tenet that their prime role in modern society is as conservation centres. In this way it is explicit that they strongly support the conservation of biodiversity. Such a 'way-forward' strategy was recently well summarised by William Conway when he recorded: 'Zoos' vision for the 21st century should be to become proactive wildlife conservation care-givers and intellectual resources; to step out beyond our fences by aiding parks and reserves; to sustain animals which have lost their habitats and conduct campaigns to restore them; and to provide from our collections as many key species as possible to be the stimulus and centrepieces of conservation around the world' (Conway, 1999).

In this particular context, it is relevant to refer to a viewpoint expressed by the late Director of Taronga Zoo, John Kelly. In a Guest Essay, for the International Zoo Yearbook, he wrote on the subject of effective conservation in the twenty-first century, and the need to be more than a zoo. In this, Dr Kelly warned that if zoological organisations are to continue their work to preserve biodiversity, it is critical that they continue to adapt and develop, otherwise they run the risk of becoming extinct themselves (Kelly, 1997).

Therefore, it is my opinion that if zoos are to have a sustainable future, it is of the utmost importance for the global zoo community to commit itself to the vision of the World Zoo Conservation Strategy. In particular, for zoos to adopt the concept of partnerships between zoos and other organisations; to scientifically manage total populations of threatened species (in situ/ex situ) in the best interest of the species concerned; to promote strategic collection planning and metapopulation management to aid the development of holistic and viable conservation strategies; to maximise educational, training and research potentials; and to embrace the mission of working in partnership to conserve nature and the world's biological diversity. And in particular to ensure that zoos have close involvement with the local community, and for them to fit within the wider context of tourism and wildlife.

With the increased pressure on fragmented wild populations of threatened wildlife and associated habitat, the role of the zoos of the world in global conservation is more important today than ever before. Whereas zoos often used to be berated as a drain on wild populations, now, through scientifically managed captive breeding programmes, they are very much contributors to wildlife populations. Also, it is acknowledged that in an increasing number of cases many species will survive in the wild only with assistance from zoos, while many others could not exist at all without zoos. As Lovejoy (1980) predicted: 'Ultimately the extent of zoo cooperation will determine how full tomorrow's ark will be'. Therefore species survival will in many cases be - 'by invitation only'.

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References

- Barlow, GM, Wilcken, S, Hopkins, J and Lees, C (1999) Zoo involvement in the Australian recovery process. In Proc. of the Seventh World Conference on Breeding Endangered Species: Linking Zoo and Field Research to Advance Conservation. Cincinnati Zoo & Botanical Garden, Cincinnati.
- Barreto, R (1999) SSC strategic planning gathers momentum. *Species* 15: 31-32.
- CBSG/SSC/IUCN (1997) ARAZPA regional report. *CBSG News* 8 (2): 4.
- Conway, W (1995) Wild and zoo animal interactive management and habitat conservation. *Biodiversity and Conservation* 4 (6): 573-594.
- Conway, W (1996) The in situ conservation program of the wildlife conservation society. *International Zoo News* 43 (5) 274-279.
- Conway, W. (1999) The changing role of zoos in the 21st century. In Proceedings of the 54th World Zoo Organisation Annual Conference. Pretoria, South Africa.
- Durrell, LM and Mallinson JJC (1998) Guest essay - The impact of an institutional review: a change of emphasis towards field conservation programmes. *International Zoo Yearbook*. 36: 1-8.
- EAZA/WZO (2000) In Situ Conservation Campaign of Zoos for the New Millennium, pp.30. Workshop organised by the European Association of Zoos and Aquaria (EAZA) and the World Zoo Organisation (WZO). Cologne Zoo, Cologne.
- Edinburgh, Duke of (1993) Foreword p. vi. In *The World Zoo Conservation Strategy: The Role of Zoos and Aquaria of the World in Global Conservation*, IUDZG/CBSG/SSC. Chicago Zoological Society, Chicago.
- Ellis, S (2001) Conservation breeding specialist group CBSG. In *Encyclopedia of the World's Zoos Vol. 1 (A-F)*, 295-298, Bell, C (ed.). Fitzroy Dearborn Publishers, Chicago.
- Ellis, S and Seal, US (1995) Tools of the trade to aid decision-making for species survival. *Biodiversity and Conservation* 4 (6): 553-572.
- Feistner, ATC and Mallinson, JJC (2000) A recipe for species conservation: Multidisciplinary ingredients. In *Has the Panda Had its Day?: Priorities for the Conservation of Mammalian Diversity*, 17: 309-323, Entwistle, A and Dunstone, N (eds.). Cambridge Biology 3. University Press Cambridge, Cambridge.
- Galbraith, D (2000) Role of zoos and botanical gardens: The voyage of the ark. *Pappus*, 19 (2):13-16.
- Hilton-Taylor, C (Compiler) (2000) *The 2000 IUCN Red List of Threatened Species*. Gland, Switzerland.
- Hoellen, C (1997) The role of North American Zoos in developing world countries.
- Hutchins, M and Conway WG (1995) Beyond Noah's ark: The evolving role of modern zoological parks and aquariums in field conservation. *International Zoo Yearbook* 34: 117-130.
- IUCN/SSC (1987) *The IUCN Policy Statement on Captive Breeding*. Gland, Switzerland.
- IUCN/SSC (1991) *A Global Network for Species Survival*. Gland, Switzerland.
- IUCN/UNEP/WWF (1991) *Caring for the Earth: A Strategy for Sustainable Living*. Gland, Switzerland.

- IUDZG/CBSG/SSC (1993) *The World Zoo Conservation Strategy: The Role of the Zoos and Aquaria of the World in Global Conservation*. Chicago Zoological Society, Chicago.
- Julin, H (2001) Environmental management symposium in Aalborg. WAZA Newsletter of the World Association of Zoos and Aquariums 2:8.
- Kelly, JD (1997) Effective conservation in the twenty-first century; the need to be more than a zoo: One organisation's approach. *International Zoo Yearbook* 35: 1-14.
- Kleiman, DG and Mallinson, JJC (1998) Recovery and management committees for lion tamarins: Partnerships in conservation planning and implementation. *Conservation Biology* 12 (1): 27-38.
- Kock, M (1993) Future of African wildlife: relic of the past or response of the future? A veterinarian's viewpoint. In *Proc. Scottish Prudential Wildlife Symposium*. William Dick Bicentenary, pp.43-47. University of Edinburgh, Edinburgh.
- Lovejoy, TE (1980) Tomorrow's ark: By invitation only. *International Zoo Yearbook*. 20: 181-183.
- Mallinson, JJC (1991) Partnerships for conservation between zoos, local governments and non-governmental organisations. *Symposium of the Zoological Society of London* 62: 57-74.
- Mallinson, JJC (1996) The development of cooperative partnerships in support of in situ conservation programmes. *International Zoo News* 43 (5): 389-399.
- Mallinson, JJC (1998) The diverse role of zoos in a changing world: From zoological parks to conservation centres. In *ARAZPA/ASZK Conference Proceedings* 9-19. Taronga Zoo, Sydney.
- Mallinson, JJC (2001) Saving Brazil's Atlantic rainforest: Using the golden-headed lion tamarin *Leontopithecus chrysomelas* as a flagship for a biodiversity hotspot. *Dodo* 37
- Mallinson, JJC and Hartley JRM (1997) Partnerships in conservation. *Dodo, J. Wildl. Preserv. Trusts* 33: 8-13.
- McAllister, E (2000) Small but good: How a small zoo can go along way in in situ conservation programs, pp.5. In *Minutes of the Scientific Session of the 57th Annual Conference of the World Association of Zoos and Aquariums*. Palm Desert, California.
- McGregor Reid, G (2001) Marketing zoos beyond 2000. WAZA Newsletter of the World Association of Zoos and Aquariums 2:9.
- Mittermeier, RA (1986) Primate conservation priorities in the Neotropical region. In *Primates, The Road to Self-sustaining Populations*, Benirschke, K (ed.). Springer-Verlag, New York.
- Montagu, Lord (1983) *Britain's Zoos: Marketing and Presentation - The Way Forward to Viability*. A report of the committee of enquiry chaired by Lord Montagu of Beaulieu. English Tourist Board, London.
- Orenstein, AF and Johnson, SP (2001) Wildlife Conservation Society WCS pp. 1334-1337. In *Encyclopedia of the World's Zoos Vol. 3 (RZ)*. Bell, EC (ed.). Fitzroy Dearborn, Chicago.
- Parker, P (1992) The Chicago Zoological Society's affair with Australian conservation. *Bison* 6:12-19.
- Rabb, GB (2000) Zoos and aquariums as conservation centers and centers of care. In *The World Association of Zoos and Aquariums Minutes of the Scientific Session (WAZA) Section 1: 1-24*. 55th Annual Conference. Palm Springs, California.
- Rabb, GB and Sullivan, TA (1995) Coordinating conservation: Global networking for species survival. *Biodiversity and Conservation* 4 (6): 536-543.

- Rowan, A and Hoage, R (1995) Public attitudes toward wildlife: The awakening awareness. In *The Ark Evolving: Zoos and Aquariums in Transition*, Wemmer, CM (ed). Smithsonian Institution, Front Royal, Virginia.
- Tilson, RL (1995) In support of nature, the Minnesota Zoo's 'adopt-a-park' program. In *The Ark Evolving: Zoos and Aquariums in Transition*, pp. 180-195. Wemmer, C (ed.). Smithsonian Institution, Washington, D.C.
- Wheater, RJ (1994) Past progress and future challenges. In *Creative Conservation Interactive Management of Wild and Captive Animals*, Olney, PJS, Mace, GM and Feistner, ATC (eds). Chapman & Hall, London.
- WZO (1995) *Zoo Future 2005*. World Zoo Organisation - IUDZG. pp30.