

Building a Future for Wildlife

The World Zoo and Aquarium Conservation Strategy



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Zoo-bred Przewalski's mares (*Equus przewalskii*) being released to the Gobi B National Park, Mongolia, in summer 2004 (WAZA Project Nr. 03002), for details see www.waza.org

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Foreword



I congratulate the World Association of Zoos and Aquariums (WAZA) and its partners on completing the important task of preparing this World Zoo and Aquarium Conservation Strategy (WZACS). It is a timely document that refines the previous thinking of the 1993 World Zoo Conservation Strategy and brings *ex situ* institutions into the mainstream of biodiversity conservation and sustainable development. This Strategy provides a common philosophy for zoos and aquariums across the globe and defines the standards and policies with which you hope to achieve your conservation goals.

Your first Strategy was published in a time of great hope - the days of Rio and the beginnings of the Convention on Biological Diversity - and was guided by IUCN's own World Conservation Strategy. Since that time, the situation for the environment has not improved and the world's attention is focusing on economics and security.

In this context, the critical role of zoos and aquariums within conservation is more important than ever. Zoos and aquariums are in a unique position: that of providing conservation in a genuinely integrated way. For the young people of the world's cities, zoos and aquariums are often the first contact with nature and so you are the incubator of the conservationists of tomorrow. The research you conduct is vital to our understanding of the components of biodiversity and their interactions. The public awareness campaigns and communication programmes you oversee are critical in making the general public understand both the utilitarian and the aesthetic importance of nature. Your efforts to build capacity, and transfer technology to colleagues in other parts of the world, will ensure the longer term contribution of zoos and aquariums to biodiversity conservation, while also fostering a spirit of collaboration and cooperation much needed in our troubled world. Finally, the financial support that you gather for conservation in the field will demonstrate the commitment of urban populations to maintaining the wild areas of the Earth.

Our future is uncertain. However, as WAZA uses this Strategy to mobilize and enthuse the more than 600 million visitors that come to your facilities each year, your role in helping to conserve our planet's biodiversity is assured. A significant number of WAZA members are also IUCN Members and this document provides a blueprint for their contribution to implementing IUCN's Programme and Vision of 'a just world that values and conserves nature'.

As partners in conservation, IUCN welcomes the World Zoo and Aquarium Conservation Strategy and wishes you all success in implementing it.

Achim Steiner
Director General,
IUCN – The World Conservation Union





Preface



The World Association of Zoos and Aquariums (WAZA), then known as the International Union of the Directors of Zoological Gardens, produced its first conservation strategy in 1993. This ground-breaking document articulated a vision of the role of zoos and aquariums in conservation for the next 10 years; it was the first time that the world zoo and aquarium community had attempted such an exercise. The document was the result of international collaboration by many eminent professionals, was translated into many languages, and has been the conservation guide for zoos and aquariums ever since.

In 2002, in preparation for the 10th anniversary of the original strategy, a small but important meeting was held. Ulie Seal, then Chairman of the Conservation Breeding Specialist Group (CBSG) of IUCN, now sadly deceased, Bill Conway, then Director of the Wildlife Conservation Society, Bert de Boer, Coordinator of the 1993 strategy and Gunther Nogge, Director of the Cologne Zoo, met to discuss the structure of a new strategic document that would build on the success of the original, but also demonstrate other ways in which zoos and aquariums could successfully support conservation activities.

This document is the fruit of their deliberation and an enormous amount of work by a large number of people since that initial meeting. When CBSG and WAZA met for their joint annual meetings in Vienna in August 2002, workshops were held to determine what the contents of a new strategy should be and how it should be structured. Chapter coordinators were appointed and a wide selection of collaborators identified for each chapter. Under the auspices of the WAZA Conservation Committee, chaired by Jo Gipps, the two-year process of creating, reading, editing, rewriting, changing and improving each chapter led to the formal adoption of the new draft strategy at the WAZA annual meeting in Taipei in November 2004.

All those who have had input into this document are listed in **Appendix 3**, in alphabetical order. This list includes members of WAZA Council, WAZA Conservation Committee, the authors of each chapter and all those who collaborated and commented on them, attendees at CBSG and WAZA workshops, and a large number of individuals who have commented on parts, or the whole, of the document over the last two years. The list is long, full of familiar names of professionals from within and outside the zoo community, and hugely international; we thank them all, most sincerely. Their contributions have made this document what we hope it is: a truly international conservation strategy for the zoos and aquariums of the world for the next five to ten years.

A few individuals deserve special mention: the World Zoo and Aquarium Conservation Strategy Core Group consisted of both of us, Miranda Stevenson, Peter Olney, Onnie Byers, Peter Dollinger, Chris West, Bert de Boer and Mark Reed (their affiliations are contained in **Appendix 3**). Miranda Stevenson coordinated



the whole project with extreme care and good humour and Peter Olney edited the document, to his usual impeccable standard. Our thanks go to Peter Dollinger, the WAZA Executive Director, for his hard work and expertise in collation, layout and design of the document. We are most grateful to the core group for their time, energy and devotion to the project and to our colleagues from CBSG whose support was invaluable.

The 1993 strategy consisted of a Foundation Document and an Executive Summary. This new strategy will also include a Resource Manual (currently in preparation) which will be used by individual zoos and aquariums, by regional zoo associations, and by WAZA itself, to develop Action Plans to enable each to implement the strategy.

This strategy is for all members of the world zoo and aquarium community, not just the members of WAZA. It is also a document that, we hope, will enable that community to articulate, for a more general audience, where it sees its conservation priorities lie in the future. As the Director General of IUCN states in his foreword, there is no doubt that zoos and aquariums have a vital role to play in the conservation of the biodiversity of our planet. We hope that this document describes how zoos and aquariums around the world can indeed play their part successfully and we commend it to you.

Ed McAlister
President of WAZA

Jo Gipps
Chair, WAZA Conservation Committee



Introduction

'Today more and more of us live in cities and lose any real connection with wild animals and plants.'

(David Attenborough, 2004)

There are two quite simple reasons for having a World Zoo and Aquarium Conservation Strategy (WZACS). Zoo professionals worldwide would benefit from a cohesive document that provides a common set of goals. At the same time many people who are active in the fields of environmentalism and conservation, or who are merely concerned observers, with worries and questions about conservation and animal welfare, want to know whether they should support zoos. Thus a WZACS has at least to provide answers to fundamental questions whilst setting out best practice for the zoos and aquariums of the world. Why do zoos and aquariums exist? What is their unifying philosophy and purpose? What is their vision and relevance in a world faced with unprecedented challenges as the needs of humans and animals and plants seem to compete? How can they have a measurable influence on conservation in the wild? In short, what is the benefit of having zoos and aquariums and what successes can they already point to? The world zoo and aquarium community knows that it has a powerful part to play in achieving global sustainability. In answering these questions the community must inspire people who visit zoos to become part of the same movement.

The first World Zoo Conservation Strategy (WZCS) was published over 10 years ago and was rooted in the IUCN World Conservation Strategy, 'Caring for the Earth', which in turn related to the United Nations Conference on Environment and Development acceptance of the Convention on Biological Diversity (CBD) at Rio de Janeiro in 1992. The WZCS has proved extremely valuable in informing readers of what zoos can actually do, and in establishing a basis of understanding and unified direction.

This second document, the WZACS, defines and explains the strategic vision of the members of the World Association of Zoos and Aquariums (WAZA) in support of its overarching conservation mission. This foundation document sets out policies and standards to be reached under headings relating to the key functions and activities of all zoos and aquariums, however diverse, and focuses on the long-term demonstrable achievement of conservation. It is intended to provide a future blueprint for urgent local and collective action by zoos and aquariums worldwide through directed policies and a series of accompanying manuals containing more detailed procedures and examples of good practice.

To be successful the WZACS must shape strategic thinking and guide hands-on practical work by WAZA members and, more widely, promote a sense of common purpose, leadership and partnership with fellow conservationists and environmentalists (Box 1). Publication of this second Strategy follows the World Summit on Sustainable Development in Johannesburg in 2002 and it reflects the many changes in the external operating environment of all conservation organizations and also the shifts in the intrinsic, collective principles and priorities of zoos and aquariums throughout the world.



Box 1

What is WAZA?

WAZA'S MISSION AND OBJECTIVES

WAZA, the World Association of Zoos and Aquariums, is a global organization which unifies the principles and practices of over 1,000 zoos and aquariums, which receive over 600 million visitors annually, and sets standards for increasing achievement of conservation.

The objectives of WAZA are to:

1. promote cooperation between zoological gardens and aquariums with regard to the conservation, management and breeding of animals in their care;
2. promote and coordinate cooperation between national and national and regional associations and their constituents;
3. promote environmental education, wildlife conservation and environmental research;
4. assist in representing zoological gardens and aquariums in other international organizations or assemblies;
5. promote cooperation with other conservation organizations;
6. promote and use the highest standards of animal welfare and husbandry.



Environmental threats and biodiversity loss

Zoos and aquariums now operate in a world of accelerating environmental threats and reduction in biodiversity. In the last ten years climatic changes, over-exploitation of natural resources, increases in the negative impact of invasive species and overall environmental degradation have all continued. The value and vulnerability of species and ecosystems and their influence on humans have been poorly reflected in the media; public perception has been focused on crises of conflict, drought, famine and migration rather than root causes linked to the unsustainable use of natural resources. Similarly human development and demands on sustainability, and concerns about globalisation and corporatism, dominate international political agendas.

Underlying everything is the continuing essential fact that there are too many human beings consuming far too great a proportion of the Earth's natural resources to allow non-human species a share that secures their future. The predicted increase in human population and the pronounced inequality in distribution of wealth among and within nations, are two of the major problems facing humankind and, directly and indirectly, the conservation of species and habitats.

'At current levels of consumption of natural resources humanity needs three earth-sized planets to survive' (E. O. Wilson 2002) (Box 2).

The outlook is not wholly negative. The Convention on Biological Diversity (CBD) (Box 3) has generated a huge number of regional and national initiatives often supported by legislation. National Biodiversity Strategies and Biodiversity Action Plans (BAPs) have been developed and operate down to local levels with community and stakeholder participation. Environmental regulations are being strengthened in many countries and corporations held more accountable for their activities. There are favourable trends towards integrated efforts by international, governmental and non-governmental agencies, based on objective science and inevitably requiring the use of multi-disciplinary teams. There is a greater understanding and acceptance of the serious threats to the environment, biodiversity and ultimately humanity itself. Efforts have been made to focus limited conservation resources through the identification of biodiversity 'hotspots'. These 'hotspots' also coincide with areas of greatest human development need and point towards an additional focus on sustainable use of the environment.

Technological advances are likely to continue and may have both positive and negative effects. Continuing benefits will arise from the global information technology revolution in terms of sharing information and exerting influence on political agendas. The potential is there for technological solutions to all aspects of energy production, waste management and provision of food and water to people. The economic benefits of sustainable management of natural resources for the benefit of local people, and of the maintenance of environmental services to lessen the effects of flooding, erosion, silting-up, pollution and other problems are clear, but need to be automatically taken into account when decisions are made.

Box 2

Illustrating Global Environment Trends

1. Over-exploitation of natural resources, deforestation, over-fishing, expansion of farmland/habitat degradation, pollution, shrinkage and fragmentation.
2. Climate change, with attendant global warming, floods, droughts and fires.
3. Introduction of invasive species, competition, predation, transmission of disease and cross-breeding.
4. Reduced biosecurity for humans with increased number of emerging diseases, such as AIDS, Ebola, SARS.

Box 3

The Convention on Biological Diversity (CBD)

Article 9 – *ex situ* conservation

Each Contracting Party shall, as far as possible and as appropriate, and predominantly for the purpose of complementing *in situ* measures:

- (a) Adopt measures for the *ex situ* conservation of components of biological diversity, preferably in the country of origin of such components;
- (b) Establish and maintain facilities for *ex situ* conservation of and research on plants, animals and micro-organisms, preferably in the country of origin of genetic resources;
- (c) Adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions;
- (d) Regulate and manage collection of biological resources from natural habitats for *ex situ* conservation purposes so as not to threaten ecosystems and *in situ* populations of species, except where special temporary *ex situ* measures are required under subparagraph (c) above; and
- (e) Cooperate in providing financial and other support for *ex situ* conservation outlines in subparagraphs (a) to (d) above and in the establishment and maintenance of *ex situ* conservation facilities in developing countries.



The role of zoos and aquariums

In many countries historical and social perceptions of zoos as entertainment menageries still persist, and in some cases are justified. A sector frequently hostile to zoos is the growing animal-rights and animal-welfare lobby, which emphasizes the interests of individual animals, rather than the conservation of species or ecosystems; further opposition comes from that part of the conservation movement which doubts the justification for removing animals from the wild. If zoos and aquariums are to play an active part in conservation they must face opposition head-on, by understanding criticisms, adapting where necessary and explaining their actions in a way that gains public support. They must also make clear to the general public that their mission is one of conservation, which is conducted in tandem with the highest welfare standards.

Within these wider contexts and alongside major trends, zoos and aquariums have to achieve and promote a clearer view of their unique role and the contribution they can make as part of a global conservation coalition. More coordination of activities and focus of resources towards high priorities need to be coupled with a wider application of good management practices, in particular continuous evaluation of the impact of key projects (Boxes 4 and 5).

Individual zoos and aquariums, and the zoo community, are pre-eminently suited to emphasize the global aspects of conservation. Scientific knowledge of the interconnections of all life systems and habitats has greatly increased in the last few years and it is becoming increasingly evident that conservation is not only a matter of saving species and habitats but, to be successful, also needs cooperation and a global approach. Zoos and aquariums, because they care for, and have expertise in collections of living animals from around the world, and because of their global network, can play a major role in promoting conservation cooperation on a global scale.

Only zoos, aquariums and botanic gardens can operate across the whole spectrum of conservation activities, from *ex situ* breeding of threatened species, research, public education, training and influencing and advocacy, through to *in situ* support of species, populations and their habitats; they uniquely have a massive 'captive audience' of visitors whose knowledge, understanding, attitude, behaviour and involvement can all be positively influenced and harnessed. They have a huge resource of technical skills and dedicated people. As habitats shrink and collection-managed populations grow, the definition of what is a zoo, what is a botanic garden, what is a reserve, and who is a collection-based conservationist, who is a field-based conservationist, will inevitably blur. Zoos, aquariums and botanic gardens have an opportunity to establish themselves as models of 'integrated conservation' and the means of achieving this in a collective fashion for zoos and aquariums is through the WZACS. Other bodies, such as conservation bodies and governmental departments, can use the WZACS and the integrated conservation approach, and this will bring benefits to all concerned with conservation.

Box 4

How can we tell if conservation efforts of zoos and aquariums are successful?

QUALITATIVE MEASURES THAT INDICATE SUCCESSFUL ACHIEVEMENT OF CONSERVATION

1. Increasingly secure populations of species in the wild.
2. Increasing areas/volumes of secure, sustainable habitat.
3. Greater knowledge and application of species biology, ecology and conservation science.
4. More political awareness of environmental issues with better environmentally-friendly decision making and increasingly higher conservation priorities.
5. Increasing capacity in habitat areas through training, education and public awareness.

Box 5

Definition of Conservation

Conservation is the securing of long-term populations of species in natural ecosystems and habitats wherever possible.

Although the definitions of conservation are many and varied it is crucial to have a common and straightforward definition that everyone understands and uses. The underlined words "natural ecosystems and habitats" signify that no amount of worthy endeavour is of ultimate value if it doesn't translate into animals and plants surviving in the wild. In addition these wild populations must be able to develop and evolve. From this it follows that we must continually assess and review how successful zoo and aquarium supported conservation programmes are.



Perhaps most important, not only do zoos and aquariums have the ability to become models of 'integrated conservation', but the fact is, they must. They must change; to be useful, to be proactive, and to be radical in their approach. The world around us has changed immeasurably in the last 10 years, and so must zoos and aquariums and their staff. They can be conservators, educators, scientists and powerful tools for political change if they wish to be. They therefore have a choice – to forge a new identity and purpose or to be left behind by the conservation movement. The WZACS gives zoos and aquariums the map with which to begin this journey, and although some may be further along the way than others, it is time for them all to change from a walk to a run (Box 6).



The 'Pongoland' of Leipzig Zoo not only combines a research facility with an up-to-date exhibit for Western chimpanzees (*Pan troglodytes verus*) and other apes, but also links the *ex situ* keeping and breeding of the chimps to the *in situ* conservation efforts of the Wild Chimpanzee Foundation (WCF) in the Ivory Coast. Through a long-term cooperation contract, the zoo secures the financial support of conservation projects in the Tai National Park. Specific projects aim at creating awareness among the local population for the plight of chimpanzees, which now have become an endangered species. Through entertainment, the visitors of Leipzig Zoo learn about the cooperation projects with the WCF; in parallel, villagers in the chimpanzees' range are being informed about the conservation activities of Leipzig Zoo and the research in 'Pongoland'. WAZA Project Nr. 04020.

Photos: Peter Dollinger, WAZA Executive Office, and Wild Chimpanzee Foundation

Box 6

The Role and Functions that Characterize a Future Ideal for All Zoos and Aquariums

1. Increasingly commit to conservation in the wild as the primary goal and focus.
2. Utilize the unique resource available to advance research aims both *in* and *ex situ*.
3. Develop outstanding education programmes that teach proactive environmental concerns locally and globally.
4. Develop innovative exhibits to excite and inspire the visiting public whilst continually reviewing and improving the welfare of captive animals.
5. Use the collective power of global or regional associations to inform and influence political change relating to the environment.
6. Operate zoos to the highest ethical business standards to allow the generation of funds for conservation action.
7. At all times advocate the role of zoos to the general public, directly confronting issues and being steadfast in the pursuit of a conservation mission.
8. Increase inter-institutional cooperation to enhance the use of limited resources and act globally.
9. Adopt and utilize new technological advances for enhanced communication, research and education.
10. Promote organizational structures that draw upon strengths at all levels and adopt team approaches.
11. Value, recruit, further train, and retain staff at all levels.



Chapter I

Integrating Conservation



Summary

This chapter explains why and how all zoos and aquariums need to be directly associated with conservation programmes in the wild, and why and how they need to integrate their conservation work with their own organizational activities, internally and externally. Internal integrated conservation activities are those which relate to the way in which a zoo or aquarium is organized and acts in regard to its everyday dealings with visitors. External integrated activities are those which an organization conducts away from its grounds. Both internal and external activities are discussed and listed, and basic strategies are suggested. The emphasis throughout is on collaboration, coordination and communication.

Vision

The major goal of zoos and aquariums will be to integrate all aspects of their work with conservation activities. The fundamental elements of each organization's culture will be the values of sustainability and conservation, and social and environmental responsibility. These values will permeate all areas of their work and will be understood and promoted by all those working within the WAZA network.

I.1 Introduction

Zoos and aquariums began to realize their potential as a positive and influential force for conservation of wildlife as early as the beginning of the 20th century, and by the 1960s increasingly included conservation as a major part of their overall mission. Throughout the world there are zoos and aquariums, particularly those in WAZA, that play a powerful role in the conservation of biodiversity and they strive to maximize their contribution to global conservation in various ways.

The aspiration now of the world zoo and aquarium community is that all its members be directly associated with conservation programmes in the wild and be seen to be involved. No individual zoo or aquarium can contribute to conservation in a meaningful way without integrating conservation into its organizational culture; integrated conservation must be its clear and explicit aim.

Integrated conservation is achieved most effectively when all the activities of a zoo or an aquarium are linked to one another conceptually, and are strategically coordinated both externally and internally; their main aim being the conservation of threatened species and the maintenance of healthy ecosystems. The processes of coordination, collaboration and communication should become routine and easy.

Thus, integrated conservation includes a set of internal processes by which a zoo tries to manage all its activities and relationships in support of specific and well-defined conservation programmes. Integrated conservation can also serve as a flag under which conservation programmes can be communicated to zoo visitors, supporters, the media and the general public.

Integrated conservation activities will vary in different parts of the world because of cultural and social factors and the everyday reality of life. Zoos located within the high biodiversity regions often invest much of their time, energy and financial resources in providing treatment and holding areas for individual, formerly free-ranging, wild animals. These include those animals which come into conflict with people in cities and towns, those which have been intercepted in illegal trade, wild animals taken as pets which have become a burden for their owners, or those which become victims of natural disasters such as floods, fire, or earthquakes, or even those which are lost, have strayed or have been stolen. These zoos are often heavily involved in welfare issues and this can affect the way the institution engages in, or even interprets, integrated conservation.



Zoos and aquariums around the world can undertake field conservation both in their own country and abroad. Many zoos in Europe and North America do much of their conservation work abroad, particularly in high biodiversity countries, as well as working within their own region, whereas the zoos and aquariums of Australasia, an area that includes some of the hot-spots for endemics, collectively directs more conservation resources to within-region projects than to outside-region projects. Many zoos and aquariums in high biodiversity countries such as in Central and South America, Africa, and South and East Asia are still trying to establish their own roles in integrated conservation. These institutions often have significantly larger visitor numbers than zoos elsewhere and these can utilize much of their staff's work and energy. Such zoos are, however, ideally situated to educate very large numbers of people about their country's conservation problems and potential. Thus, the notion of integrated conservation may mean different things in different places.

There is always potential competition for resources between a zoo's revenue-producing activities and its conservation desires and needs. A zoo or aquarium which is financially successful will always be able to allocate or raise more money for conservation than a zoo which is struggling to meet its commitments to its own animals, staff and visitors. However, any zoo or aquarium, however small or short of surplus money, can find meaningful ways to contribute to conservation. Ultimately, we would expect that, rather than creating competition, the conservation role of zoos and aquariums will become so well integrated with institutional success that good conservation will actually enhance the institutional budget.

The World Zoo and Aquarium Conservation Strategy (WZACS) emphasizes that this document and this chapter apply to all zoos and aquariums, whether rich or poor, of whatever size or administrative conditions and from whatever country or culture.

1.2 Internal and external integrated conservation

Integrated conservation falls into two distinct but related sets of activities, internal and external. Internal activities are those which relate to the way in which an institution organizes itself and acts in regard to its day-to-day visitor-related actions. External activities are those which an institution conducts away from its own grounds.

Internal integrated conservation

Most zoos and aquariums around the world already perform many activities that would be described as components of internal integrated conservation. Some of these are listed below.

- All zoos and aquariums care for and exhibit animals in enclosed areas. Sometimes they construct groups of enclosures, often linked by a biological or conservation-related theme that is based on habitat, geographical location or ecosystem. In some cases, exhibits contain several different species, both animal and plant.
- Zoos and aquariums serve as recreational facilities for families, social groups and individuals all over the world; in many parts of the world they are one of the major sources of safe and affordable outdoor entertainment.
- Through graphics and other methods of interpretation and engagement, such as keeper talks, animal feeds and natural-behaviour animal shows, they can explain the biology and behaviour of animals within the enclosures, including reproduction, social behaviour and population ecology. Some zoos also explain about the wild habitats where the animals are found, the threats facing the species in the wild and what zoos are doing to help conservation.
- Many zoos have education departments for both formal and informal educative processes, although in some parts of the world, education is undertaken by staff that have

other duties or even by local non-governmental organizations.

- In order to attract visitors, zoos market themselves to the general public using many methods, including advertising, public relations and word-of-mouth. In some countries however marketing is hardly necessary and even restricting numbers at certain times may have to be considered.

In future, by adopting a strategy of integrated conservation, zoos and aquariums will also:

- adopt a truly sustainable approach to their own maintenance and construction processes by, wherever possible, building with sustainably-sourced or recycled materials with low embodied energy; minimizing energy consumption by using insulation and passive heating systems; generating their own energy by employing methods such as solar gain and wind power; and explaining all these 'green' initiatives to their visitors;
- make explicit links between all their major exhibits and field conservation projects so that visitors learn about the conservation status of the animals they are looking at;
- engage visitors and the broader community in debate about the wider issues threatening species in the wild and try to inspire them and thus secure their support;
- try to associate shops and catering facilities with conservation programmes – for example, by selling crafts from the area of a conservation programme and using the proceeds to benefit local people from that area;
- inform visitors about the conservation work of the zoo or aquarium plus that of other zoos and aquariums, conservation organizations and government agencies;
- draw conservation issues to the attention of a wider audience through promotional work such as public relations activity, the Internet and advertising. The



Internet should not be underestimated as a tool for increasing awareness and building consensus on conservation issues.

External integrated conservation

The WZACS emphasizes that the modern, complex world of conservation has many agendas and many players. No single organization, be it zoo, aquarium, conservation charity or development organization should act alone. Conservation activities should be collaborative, with all the stakeholders working towards the same end, and avoiding competition or exploitation.

Conservation-active zoos and aquariums must cooperate proactively with human development agencies, national and international conservation agencies, government departments and local communities, to ensure long-term sustainable solutions. Much conservation activity in the past has failed to take enough account of wider agendas, in particular human development, and this is still of considerable concern.

Unlike many conservation organizations, which are not highly visible to the general public, zoos and aquariums, because they are popular visitor attractions, have unique opportunities to introduce their visitors to a wider world and to explain the issues of international conservation. They can greatly enhance visitor awareness of conservation matters, both problems and solutions, by integrating their own work with that of other conservation bodies; by showing evidence of that integration, they become the 'shop window'. They can also act as physical foci for integrated networks of conservation and development organizations, providing central resources such as meeting and training facilities.

Many zoos and aquariums already keep species as part of cooperative and coordinated national, regional or international breeding programmes, collaborating with other zoos and other breeding facilities. The pattern of involvement in such programmes varies throughout the world; some regions have well established programmes, while others are only just beginning such work. By adopting a strategy of integrated conservation, zoos and aquariums will also:

- achieve their conservation aims in the field by forming strategic alliances with other organizations also working locally in the region of their field projects, including governmental and non-governmental, conservation, community, education and development organizations;
- where possible, raise funds to support field conservation projects or programmes, from visitors, individuals, corporations, charitable trusts or other sources;
- where possible, coordinate or participate in their own field-based conservation projects, whether these are practical (technical assistance), educational (capacity development and community involvement) or involve scientific research;
- work with breeding and welfare facilities within the localities of their field conservation projects, such as other local zoos, breeding facilities or sanctuaries;
- conduct or support appropriate scientific research, both in the field and in the zoo - such research should contribute directly to the conservation of wild nature, preferably the protection of habitats and declining species;
- participate in the activities of the Species Survival Commission of IUCN, including thematic groups such as the Conservation Breeding Specialist Group, the Re-introduction Specialist Group, and the Veterinary Specialist Group;
- engage in and stimulate political debate with their own governments and others.

I.3 Conclusion

Integrated conservation, as outlined above, is not easy to achieve. However, many zoos and aquariums have begun the process and success is becoming increasingly obvious.

Recommendation

The World Zoo and Aquarium Conservation Strategy (WZACS) calls on institutions to pursue a strategy of integrated conservation and strive to allocate all their financial and human resources carefully and intelligently, with maximum cohesive and strategic thinking within their own organization, and maximum collaboration with others. This will achieve the greatest sustainable conservation benefit for threatened species, their habitats and their human neighbours.



Chapter 2

Conservation of Wild Populations



Summary

This chapter presents a vision of zoos and aquariums as a force for worldwide conservation, and details how this can be achieved. From a framework based on the Convention on Biological Diversity and the UN Millennium Development Goals, policy is translated into conservation action through involvement in regional, national and local Biodiversity Action Plans and Species Recovery Programmes. This ensures that zoo and aquarium-based activities are integrated, rather than isolated, activities. These institutions engage actively in conservation through diagnosis, problem solving and remedial action, with an emphasis on sustaining long-term studies and programmes. For example, zoos and aquarium wildlife veterinarians are uniquely placed to contribute to research on emerging diseases, and to work at the interfaces between wild and domestic animals and between humans and animals (such as in great ape ecotourism). Wildlife health is also an integral part of the reintroduction and translocation programmes which may be increasingly needed to cope with habitat fragmentation and human-wildlife conflict. All these activities will be most effectively carried out by field units of conservation professionals. Zoos and aquariums are developing as training centres for these professionals, thereby also building local conservation capacity. They are also centres of excellence in animal welfare, breeding, small population management and wildlife health care and use their sites to attract and sustain local wildlife. Moreover, the annual 600 million visitors that zoos and aquariums attract represent an important resource that can be used for funding field conservation. In conclusion, zoos and aquariums are ideally placed to contribute to conservation in the wild, in their own and other countries, through application of their knowledge, skills and resources. Developing this contribution should be a major focus.

Vision

Zoos and aquariums will make further contributions to conservation in the wild by providing knowledge, skills and resources through initiatives in zoo breeding, translocations and reintroduction, wildlife health, research, training, education and by funding field activities. Zoos and aquariums will be an important force for worldwide conservation by their employment or support of field workers active in the conservation of wild animals and their habitats.

2.1 Introduction

The moral obligation of zoos and aquariums to make a direct contribution to conservation in the wild and to be a more potent force for conservation internationally is not a new aspiration. It has however, gained greater momentum in recent times as people have moved from wanting to look at and learn about animals in zoos to wanting to do something about their conservation in the wild as well. Now is the time to move even more strongly toward concerted conservation action, and for zoos and aquariums to expand their support for field conservation activities and develop corresponding systems of accreditation.

From the outset it is important to acknowledge that zoos and aquariums vary in their capacity to support conservation in the wild. This chapter sets a framework for what can be achieved, singly or in collaborative partnerships. It is not prescriptive, and inevitably different institutions will engage in different activities. Support for conservation in the wild can be through direct action to improve habitats and target species numbers, or indirect action such as education, fund-raising and research to guide policy and practice. These indirect approaches are more fully dealt with in other chapters but are also mentioned briefly below.



2.2 International context

In the introductory sections of the 1993 World Zoo Conservation Strategy (WZCS), the World Conservation Strategy published by IUCN in 1980 was cited as an important framework for looking at conservation action. However, the policy landscape changed when the Convention on Biological Diversity (CBD) was adopted at the Earth Summit in Rio de Janeiro in 1992. The zoo and aquarium world must now consider its conservation proposals and actions in this context, rather than developing zoo-based initiatives which are separated from mainstream conservation efforts.

Over 180 countries are signatories to the CBD (www.biodiv.org), which is legally binding and has three goals: conservation of biological diversity; sustainable use of the components of biological diversity; and the fair and equitable sharing of the benefits arising from the use of genetic resources (see also Box 3). An important point to bear in mind in this international context is that the CBD distinguishes between 'conservation' and 'sustainable use', which are two separate objectives in the convention, unlike the World Conservation Strategy, where sustainable use was perceived as a part of conservation.

2.3 Development

As well as considering the spectrum of conservation action, from global to local, zoos and aquariums need to be aware that achieving effective conservation and sustainable use are only likely to be lasting if programmes are implemented in the context of local cultures, livelihoods and development needs. In broad terms, the United Nations Millennium Development Goals (www.undp.org/mdg) provide a useful framework for approaching this issue. The bulk of the goals and targets focus on reducing poverty and hunger, and improving health and education, but there is also an environmental sustainability goal, with a target 'to reverse the loss of environmental resources' by 2015. It is important that this target is not forgotten, and that it is integrated into the achievement of the other development goals.

2.4 Reintroductions and translocations

The earliest proposals for conservation of wild populations by zoos were through breeding and reintroduction, building on the successes of breeding American bison, *Bison bison*, and European wisent, *Bison bonasus*, at North American and European zoos and wildlife parks respectively. Zoos and aquariums can act as 'arks' in which carefully managed populations of animals are bred and the progeny released back into the wild.

In appropriate circumstances, zoos can provide the necessary animals, skills and knowledge for breeding: identifying breeding stocks (through genetic analysis when necessary); establish-

The CBD is the overarching convention for addressing conservation issues, but there are a number of complementary conventions: the 1971 Ramsar Convention on Wetlands (www.ramsar.org), the 1972 World Heritage Convention (www.unesco.org/whc), the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (www.cites.org) and the 1979 Convention on Migratory Species (www.cms.int). These are also important for guiding conservation policy.

The move from policy to changes on the ground is brought about through various action plans, in particular regional, national, and local Biodiversity Action Plans (BAPs), which nationally are a requirement under the CBD. Zoos and aquariums can focus their conservation attention on BAP priorities, thereby contributing to wider processes and collaborating with a broader set of partners than those generated by the zoo community alone. Where BAPs are weak, or do not exist, zoos and aquariums can contribute information, ideas and staff to formulate or implement effective BAPs.

Attempting to bridge the conservation and development agendas is a big step, but if it can be done, zoos and aquariums have an opportunity to tap into, or at least influence, huge amounts of official development assistance (often called 'aid'). Box 2.1 shows two examples, one at the policy level and one in the field, which indicate how this can be done. Other conservation initiatives supported by zoos and aquariums have taken community wildlife management approaches, in an effort to ensure that these stakeholders do not pay disproportionately for international conservation benefits. Where there is strong social cohesion and a capacity for partnership approaches to conservation management, this policy can be effective and long-lasting.

ing appropriate social units for successful breeding and rearing; attending to behavioural needs; determining diet and welfare standards. By combining these aspects of husbandry, implementing pre-release training and acclimatization, and conducting research to improve breeding and reintroduction success, suitable animals can be provided for reintroduction into the wild. (See also Chapter 9.)

The spectacular early success of the Arabian oryx *Oryx leucoryx* restoration programmes in Oman and Saudi Arabia showed that zoo-bred animals could be released in appropriate wild



areas, at appropriate times, and using appropriate release techniques, to build up populations in the wild. As more attempts were made, international standards were developed for best practice in reintroduction projects

(www.iucn.org/themes/ssc/pubs/policy/reinte.htm).

However, the simple logic of this approach often belies the complex reality on the ground, and many attempts to reintroduce species into the wild have had limited success and/or been hugely expensive. Some of the obvious limitations relate to animals having to cope with dangers of the wild; clear examples are heavy predation of reintroduced Golden lion tamarins *Leontopithecus rosalia* and Ruffed lemurs *Varecia variegata*. Even more complex problems arise when zoo bred chimpanzees *Pan troglodytes* which have lost their fear of humans are released and then come into conflict with local people – although 17 chimpanzees were released onto Rubondo Island NP in Tanzania during 1966-69 and have since increased to about 50 individuals.

Zoos and aquariums need to expand research on methods to improve reintroduction successes. New factors promoting extinction may arise at later stages of re-establishment that were not present or did not need to be prevented earlier on. For example the early success of the Arabian oryx restoration programme in Oman was radically changed by extra-territorial incentives to capture for stocking elsewhere; this could not have been foreseen. Reintroduction projects are not only about the animals being reintroduced but in many cases are a combination of ecological, social, economical and political aspects that all need to be taken into consideration, and over a very long time frame. By not addressing socio-economic aspects and integrating adaptive management into a project, the result in the long term may be frustration and failure.

Releasing animals to reduce a zoo surplus, or ostensibly for animal welfare reasons, is more likely to increase disease risks and lead to behavioural and environmental problems with resident animals and vegetation, and other dangers both to humans and animals, than to improve successful conservation of wild populations. Such releases should be limited to occasions when adequate research and precautions have been taken to ensure there will be no adverse impact on existing wild populations or ecosystems. There should also be careful monitoring, post-release, in order to provide sound scientific information which may influence future release attempts.

An important activity which uses a number of skills from reintroduction programmes is the translocation of wild animals. This may be done, for example, to reduce conflicts between humans and wildlife where wild animals are killing livestock or people (e.g. tigers, *Panthera tigris*, in Malaysia) or destroying property (e.g. African elephants, *Loxodonta africana*, in Zimbabwe or Botswana). As habitat fragmentation becomes more extreme, and climate change shifts the boundaries and quality of habitats, translocation is likely to become an increasingly important tool for conservation in the wild. The

skills and knowledge of trained and experienced zoo and aquarium professionals, as well as other husbandry experts, are needed to guide conservation management agencies in such translocation work.

Needless to say, these various efforts will do little to help populations in the wild unless the skills and resources are available to maintain and manage wild populations.

All reintroduction and translocation programmes need long-term support in research, time, dedication and money.

Box 2.1

Bridging the Conservation and Development Agendas

EAZA Bushmeat Campaign

In 2000, the European Association of Zoos and Aquariums (EAZA) Bushmeat Campaign was launched. This public awareness and fund-raising effort included a public petition, signed by 1.9 million people who visited European zoos, calling on the European Union, through its parliament and commission, to take greater action to safeguard great apes and other large mammals that are being lost through the bushmeat trade. The results, at the time of writing, are a resolution from the European Parliament to improve European aid investments (e.g. transport) to take account of bushmeat issues, and a call for greater European spending on initiatives that improve management of the bushmeat trade.

Royal Chitwan National Park

The Zoological Society of London, with funding from the UK's Department for International Development and Ka-doorie Charitable Foundation Trust developed a project that focussed on setting up four veterinary clinics in the buffer zone around Royal Chitwan National Park. The aim was to improve poor relations between the park and local communities by providing veterinary care benefits for herders to offset the costs of lost access to grazing in the park and the costs of livestock killed by tigers (*Panthera tigris*) and leopards (*Panthera pardus*). After four years, many local herders had exchanged their zebu cattle for improved breeds, which were more expensive but provided a five times higher milk yield. The new clinics and veterinary support had reduced livestock losses, and importantly the herders had stopped sending these more expensive animals into the park, because they did not want to risk their death or injury. This in turn reduced illegal grazing and lowered the risk of cattle diseases affecting gaur *Bos gaurus* and wild Asiatic buffalo *Bubalus arnee*. A previous long-term project of the Wildlife Conservation Society on the Indian rhinoceros *Rhinoceros unicornis* had resulted in a major expansion of park lands.



2.5 Wildlife health

Zoos and aquariums have large numbers of veterinary professionals working with non-domestic animals and these veterinarians can actively contribute to field conservation, as well as building a body of skills and scientific knowledge to aid intervention in the wild. Zoos and aquariums also provide a key resource for training wildlife veterinarians.

Veterinary input to reintroduction work involves the treatment and evaluation of diseases and illnesses and the control of parasites and pathogens in zoo and other institute breeding populations, as well as ensuring that there are no disease, stress or injury problems during translocation and release. Between these two steps, wildlife veterinarians also need to carry out health screening of animals before they are reintroduced, to avoid the inadvertent release of parasites and pathogens from breeding centres into wild populations.

Wildlife health is also an important issue in the conservation of wild populations. A long-standing problem of rinderpest is described in Box 2.2. New and emerging diseases are becoming an urgent issue, epitomized by the catastrophic declines in amphibian populations in recent years in at least four continents as a result of attack by a novel pathogenic fungus.

Other wildlife health issues also need to be understood. For example, research on the magnificent Steller's sea-eagle *Haliaeetus pelagicus*, led by Moscow Zoo, showed how lead shot in carrion was accumulating in the eagles, causing their deaths. The Wildlife Conservation Society in New York is conducting research in central Africa on the ebola virus, which circumstantial evidence suggests is devastating lowland gorilla and chimpanzee populations. More recently, the abrupt and rapid decline in Asian vulture populations has been ascribed to the use of the drug diclofenac in domestic animals, particularly cattle, whose carcasses are the vultures' main food.

2.6 Field conservation units

Reintroductions, wildlife health and zoo-based research are, however, insufficient in themselves to achieve lasting conservation in the wild. They can be successful only under limited circumstances, often to rescue a desperate situation, and with variable and uncertain success. They are often very expensive. To become a major force for field conservation, zoos and aquariums will have to create or support field units of conservation professionals.

The work of these field staff can vary from short assessment surveys to long-term studies. Small, well-focused surveys and research can be highly effective in identifying problems, starting management processes and encouraging policy change. However these need to be supplemented with long-term research to show how the animals live in the wild, and what threats they

The link between human and ape health needs even more detailed attention in the light of ecotourism developments. Such developments aim to give greater value to wildlife resources, which might otherwise be destroyed, but also bring tourists into close proximity with animals such as gorillas and chimpanzees. Mountain gorilla tourism is an excellent example of this situation: there is evidence to show that human diseases can be transmitted to wild populations of great apes. Wildlife veterinarians have a key role to play in guiding tourism operations to safeguard wild populations of apes and other species from these risks.

Box 2.2

Rinderpest

A conspicuous example of an imported disease is rinderpest, which was brought into Africa in infected cattle in the 1840s. By the 1890s it had devastated ungulate populations that had evolved in Kenya with no resistance or tolerance to the disease. The initial death toll was hundreds of thousands, with rotting carcasses smelling for months on the East African savannas. These included Serengeti wildebeest *Connochaetes taurinus*, whose numbers fell to about 300,000. The population only recovered to levels of around 1.5 million in the 1960s, after rinderpest was eradicated in cattle, and consequently in wild ruminants. Rinderpest in wildlife populations needs to be monitored, so that eradication programmes can focus on danger areas, such as the Somali-Kenya border where the endangered Hirola antelope *Damaliscus hunteri* occurs.

and their habitats face. This information will guide the long-term actions of conservation management agencies.

To take this step, zoos and aquariums will need to invest in recruiting, training and retaining field conservation staff. It is also important that these conservation professionals be versed in social, economic and institutional principles, in addition to having biological knowledge and experience. The scale of the task must be appreciated because lasting conservation outcomes require wildlife rangers and parks staff to be trained and developed, local communities encouraged to participate, and governments and private companies persuaded to give support; this requires the recruitment of, and support for, conservation professionals in the range countries.



2.7 Funding base

To accelerate this change, zoos and aquariums can pool resources, particularly funding, to achieve conservation in the wild, since many may not be able to set up their own 'field conservation units'. Zoos and aquariums attract over 600 million visitors each year (www.waza.org), and often have membership organizations which would together comprise hundreds of thousands of people. This represents a large segment of society concerned about conservation, and it represents an important resource for fund-raising for field conservation.

The range of activities and approaches that zoos and aquariums can use to fund field projects is enormous, as are the sums that can be raised. For example, a three-year review of British and Irish zoos (1997–2000) showed that over £5 million was spent by the zoos on field conservation. EAZA annual conservation campaigns (which exclude individual projects) have raised over 250,000 euros each year and Zoos Victoria (Australia) directs about A\$300,000 per year to field projects. The Wildlife Conservation Society based at Bronx Zoo, NY, disburses about \$32 million on *in situ* conservation projects each year. Sums raised through gate takings can be supplemented through corporate

sponsorship and foundation or government grants, which further lift the potential for raising substantial sums for field conservation.

The extent to which zoos and aquariums fund field conservation varies greatly. Large institutions spend substantial sums, but equally groups of zoos have collaborated to achieve particular conservation aims. For example, a consortium of 39 zoos formed the Madagascar Fauna Group (MFG - www.madagascarfaunagroup.org), which funds field activities, including conservation education and lemur reintroductions. In 2003, over 120 EAZA zoos, as well as Australasian, Russian and non-EAZA European zoos, joined together to raise funds for nine tiger field projects supported by 21st Century Tiger.

These fund-raising activities are open to zoos of all sizes; the smaller can contribute to larger consortia to ensure that enough funds are raised overall to make a difference on the ground. There is no doubt that by being seen to be actively involved in field conservation, zoos and aquariums will attract a wider donor base.

2.8 Zoo and aquarium site enhancement

The importance of zoos as refuges for urban or rural wildlife is often not given a strong focus, yet zoos can be managed to improve habitats for rare species that are not in the collection. By planting hedgerows, leaving 'weeds' and rotting wood for insects, making ponds, providing food at key times, and offering protection such as nest boxes for birds and dormice, or roosting boxes for bats, many wild animals can be encouraged. Some of these may be locally or nationally rare, such as House sparrows

Passer domesticus at London Zoo, and Bog turtles *Clemmys muhlenbergi* at Baltimore Zoo.

Furthermore, zoos and aquariums should make their visitors aware of the conservation actions being carried out, to elicit their support, and to inform them about local wildlife, both plant and animal.

2.9 Training courses

For those zoos and aquariums that plan to support effective conservation in the field, as well as increasing their own ability to conduct surveys and research, and to implement conservation management, there is a need to develop new sets of management skills. Conservation in the wild is generally implemented away from the parent institution, possibly in another country, where it is necessary to work through government agencies, often in another language and with a different culture, and where field staff have to be supported over long distances.

There is an ever-present need to train staff from wildlife, forestry, national parks, and zoos and aquariums from countries where training and education resources are scarce, but where many rare plants and animals dwell. Zoos and aquariums can

offer ideal training centres for these professionals, with courses specially designed to suit a range of candidates. Long-running examples include the Smithsonian Institution's Conservation and Research Center at Front Royal, Virginia, USA (www.nationalzoo.si.edu/ConservationAndScience/CRC) and the Durrell Wildlife Conservation Trust's International Training Centre (www.durrellwildlife.org) at Trinity, Jersey. Having a range of animals on site offers an important resource in training courses to increase skills, which then helps to build world-wide networks of like-minded professionals. The next step in this capacity building is for zoos and other institutions with acknowledged success in such training to work closely with other zoos and aquariums that have the financial capacity and interest to teach the organizers and trainers.



2.10 Evaluation

There are few published studies to date quantifying the effectiveness of conservation projects supported by zoos and aquariums, or for other kinds of conservation organizations, and there

is a need for objective methods of assessing the success of such projects.

2.11 Conclusion

Zoos and aquariums are ideally positioned to contribute directly to conservation in the wild, both in their own and other countries, by combining two approaches. First, they are uniquely qualified to provide skills and information in the disciplines of animal husbandry, welfare, breeding, small population management, and wildlife health care. Second, they can implement field projects by working with local partners and with supporting institutions. The unusual integration of these two sets of capacity, expertise and information offers an important opportunity for zoos and aquariums to contribute to conservation in the wild.

In summary, zoos and aquariums can take direct action to conserve wild populations through:

- appropriate breeding in collections, reintroduction and

translocation programmes, and advising on behaviour, diet and welfare standards;

- advice on wildlife health issues and practical assistance in the wild;
- funding;
- establishing and/or supporting field conservation units;
- education through conservation programmes, including those for wildlife indigenous to the zoo area;
- training programmes.

This direct conservation action needs to be complemented and supported by indirect conservation action: research into genetics, physiology, nutrition, behaviour, behavioural ecology, animal welfare and reproduction; fund-raising for field activities; education and raising awareness; and policywork.

Recommendations

The World Zoo and Aquarium Conservation Strategy (WZACS) calls on all zoos and aquariums to increase their work in support of conservation in the wild.

The WZACS takes the view that zoos and aquariums, encouraged by WAZA and its regional and national associations, should focus their conservation proposals and actions within local, national, or regional Biodiversity Action Plans and/or similar species recovery programmes. Where these have not been set up or are not effective, their formation should be initiated, supported or strengthened.

The WZACS emphasizes that zoos and aquariums must not work independently in reintroduction or translocation programmes but must work with other institutions, and always with the appropriate government authorities, the relevant IUCN/SSC Specialist Groups, and other governmental and non-governmental conservation agencies, particularly those in the host country, and with the relevant national or regional zoo or aquarium associations.

The WZACS strongly recommends that where possible zoos and aquariums recruit, train and support conservation staff for work in the wild; the WZACS also applauds those zoos and aquariums that have set up training courses for conservation professionals, and encourages other institutions to consider setting up their own courses or offer assistance to those courses already operating.

The WZACS calls on national and regional associations and all zoos and aquariums, however small or large, to be actively involved in raising funds for field conservation.

The WZACS suggests that zoos and aquariums enhance their sites with a view of providing habitats for threatened native species.

The WZACS recommends that regional and national zoo associations devote time and money to devising and implementing methods of assessing the success of the conservation contributions being made by their members.



Chapter 3

Science and Research



Summary

This chapter presents a vision of zoos and aquariums being serious, respected scientific institutions, integrated into the research community, and making sound scientific decisions for wildlife. It argues that through their living collections, zoos and aquariums are uniquely placed to contribute to conservation-directed research. Additionally they provide a venue for researchers and visitors to meet, thus assisting with the public understanding of science and offering opportunities to raise awareness about research and its conservation implications. Zoos and aquariums can undertake research to further their own as well as others' aims (e.g. by collaboration with universities). Research categories include research into pure and applied biological science (e.g. small population biology, behaviour, nutrition, reproductive biology), in situ conservation research (e.g. behavioural ecology, habitat survey) and research aimed at developing other roles (e.g. visitor learning, marketing, exhibit evaluation). It is argued that all research projects which contribute to conservation should be recorded and the information made broadly and easily accessible. Databases are being developed to assist with this. Zoos and aquariums can develop their research capacity by supporting specific research staff, by developing collaborative partnerships with universities, and by supporting regular publications, symposia and workshops for the presentation and discussion of scientific research. Increasing accessibility of results (to both the academic and zoo and aquarium communities) and sharing techniques and experiences maximize the benefit of research. By encouraging access to their animal collections and materials, zoos and aquariums also help develop the researchers of the future. In conclusion, there is much scope for zoos and aquariums to develop their scientific research to inform decision making within their collections as well as to contribute to field conservation.

Vision

Zoos and aquariums are fully and actively integrated into the research community and into public consciousness and understanding of science, as serious, respected scientific institutions that make significant contributions and sound scientific decisions for wildlife worldwide.

3.1 Introduction

The world faces a conservation crisis that is both urgent and enormous. Scientific research is vital in helping to identify and solve the challenges at hand. To be more effective in delivering conservation *in situ*, we must give priority to research that has clear and significant implications for saving populations and habitats in the wild. Only through sustained research programmes will we be successful in identifying conservation problems, prioritizing actions, implementing conservation interventions and monitoring the effects of our actions. Since the publication of the World Zoo Conservation Strategy a little over 10 years ago, research in zoos and aquariums has expanded in scope, quality and importance. Despite this surge, zoos and aquariums must do even more over the next 10 years.

Through their living collections, zoos and aquariums can make a unique contribution to conservation-directed research. No other network of institutions can provide, as a resource for study, representative populations of so diverse an array of the world's wildlife. In addition, zoos and aquariums offer a rare venue for researchers and the public to meet and communicate, providing a platform for interpreting the outcome of research and explaining the implications for conservation action.

Research is a tool to assist in doing any activity better – to learn from trials, from others' trials, and from related activities. Doing this systematically should be implicit in any zoo manager's thought processes. Research should not be regarded as an extra added to day-to-day work.



3.2 Scope of research

There are two main divisions of research in zoos and aquariums: (1) research that is aimed at new knowledge to help the institution achieve its goals, and (2) research that is undertaken in a zoo by others to achieve their own goals, without being inconsistent with those of the organization. Under the first division would fall research on husbandry, visitor preferences, educational and interpretation methods, conservation approaches etc., to a greater or lesser extent depending on a zoo's particular mission. The latter division would include assisting researchers from universities and research organizations by providing access to and/or material from non-domesticated species for comparative analyses.

It is impossible to describe all of the research undertaken by zoos and aquariums. However the matrix in Table 3.1 illustrates the breadth and relationships of subject matter considered. Though there are areas of overlap, we can further divide research into the following categories:

- research in pure and applied biological science (including small population biology, animal welfare, wildlife medicine, physiology, nutrition, behaviour, reproductive biology, genetics, evolution, and taxonomy);
- *in situ* conservation research (e.g. field-based ecological and habitat research);
- research aimed at identifying and improving zoo and aquarium operations (for example research on visitor learning, the effectiveness of exhibits and programmes, marketing and messaging, membership, and development and fund-raising).

All research projects undertaken by zoos and aquariums that can contribute to conservation need to be identified and recorded. Through WAZA, regional and national associations, this information should be collated and made widely accessible, to assist institutions in broadening the scope of their own

research activities. Although at present there is no systematic database worldwide, Box 3.1 provides one example of a regional database.

In addition, the global zoo and aquarium community should monitor the emergence of new areas of science for their potential application to zoo, aquarium and wider conservation problems.

Box 3.1

The AZA Computerized Database on Zoo Research

The American Zoo and Aquarium Association (AZA) has established a computerized database called the Annual Report on Conservation and Science (ARCS). It provides an excellent model for a broader database to help track research projects worldwide. The database can be searched by key word, name of researcher, topic, country or region, name of AZA institution, conservation programme title, name of cooperating institution (including governmental agencies and non-governmental organizations, colleges or universities, and non-member zoos and aquariums), type of research, or date.

In 2000-2001, AZA member institutions reported that they participated in over 2,230 conservation projects (1,390 *in situ* and 610 *ex situ*, 230 both) in 94 countries. They published 1,450 books, book chapters, journal articles, conference proceeding papers, posters and theses or dissertations. The publications can be searched using keywords, name of author, type of publication, institution name, or date.

3.3 Establishing priorities

Resources for research are finite and must be carefully targeted. Priority must be given to research that has clear implications for saving species, populations and habitats in the wild. Processes for establishing priorities of research should be informed by the unique strengths and facilities that zoos and aquariums are able to provide as well as by independent assessments of conservation need.

Zoos and aquariums should become integrated components of national and global frameworks for conservation research, by formalizing relationships with organizations whose business it is to evaluate and determine conservation priorities and associated problems. These would include government wildlife agencies;

specialist groups of IUCN - The World Conservation Union and the Species Survival Commission, particularly the Conservation Breeding Specialist Group; the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES); Migratory Species Convention (CMS); universities and research institutions, and well-established, conservation-focused non-government organizations.

Regional and global frameworks should be established or strengthened, to translate the recommendations of these organizations into zoo and aquarium-based research action plans. These action plans should operate at global, regional and institutional levels and should be regularly evaluated.



3.4 Databases and research material banks

Databases and research material banks are essential. They increase efficiency, and provide valuable support to researchers and animal managers working in zoos and aquariums, and to those working in the field. These resources are made more valuable by wide participation and access, and by being compatible with each other where possible.

The zoo community is now poised to create a powerful database that promises to enable zoo and aquarium researchers to access data on virtually all of the animals in some 600 institu-

tions spread over six continents. In its final form, this database will have all of the information on parentage and medical history for every animal in our care. The master inventory will be linked to other databases that deal with such topics as nutrition and behaviour. This will make the overall database, a web-based Zoological Information Management System (ISIS' new ZIMS), the single most powerful research tool at our disposal (Box 3.2). The establishment of this database will be carried out over the next decade. (See also Chapter 4.)

Box 3.2

ISIS and the Global Database

The International Species Information System (ISIS) was established in 1973. It is now an international non-profit membership network that is governed by an international board of trustees elected by members and that involves 613 institutions from 70 countries on six continents. Members keep and share standardized and detailed information on more than 1.8 million zoological specimens of 10,000 taxa. In the 30 years of its existence, ISIS has built a unique knowledge base and archive. It is a valuable resource for sound animal management, conservation, and basic research; it has established credibility with international regulatory conventions such as the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) and national regulatory agencies around the world.

The development of the next generation web-based Zoological Information Management System (ZIMS) was begun in 2001. ISIS' new ZIMS will be the one, global, comprehensive, accurate, real-time, web-based zoological information management system many ISIS members and others see as imperative. It will have unique lifetime animal identification numbers and a multi-institutional shared master animal record (instead of separately kept institutional records). It will automate much studbook data collection, track groups, serve aquarium needs, meet modern veterinary and epidemiological needs, and include an easy-to-query data warehouse to support management questions and research initiatives. ZIMS will be based on the first systematic review/update of our community's zoological data standards in 30 years. At the time of writing, ZIMS is partly funded through pledges by ISIS members; the ISIS Capital Campaign continues. The database will be largely or completely constructed by professional software companies.

3.5 Optimizing resources

Many zoos and aquariums now employ professional researchers. Zoo and aquarium-related scientific articles are published regularly and more and more symposia on zoo research are being organized. This trend must be maintained, supported and expanded if zoos and aquariums are to realize their full potential. In particular, zoos and aquariums must have ready access to experts in widely used disciplines; ideally, these experts would be familiar with zoos and zoo operations. Examples of collaboration are provided in Box 3.3.

Zoos and aquariums that have the resources should employ researchers. Regional and global processes should also be set in motion to build a pool of experts in important research disciplines who are an integral part of, and able to advise, the wider zoo and aquarium community. There are five main ways of creating this pool.

- WAZA and regional associations can build and support regional and global networks of zoo and aquarium

researchers by providing effective, universally accessible means of communication, discussion and collaboration.

- Zoos, aquariums and/or regional associations can build strategic partnerships with relevant research institutions to enable access to specialist advice and to skilled researchers.
- Groups of zoos or aquariums can cooperate to fund one or more specialist research positions to provide services to those institutions as well as feeding into regional and global advisory networks.
- Individual zoos and aquariums can develop research specializations and employ research staff to take these forward. These staff will become part of regional and global advisory networks.
- Institutions, both individually and collectively, can support and encourage regular publications, symposia and workshops for presenting and discussing conservation-directed science and research.



Box 3.3

Cooperative Research Efforts**AZA and the St. Louis Zoo**

The Wildlife Contraception Center (WCC) began as the American Zoo and Aquarium Association (AZA) Contraception Advisory Group in 1989. As the role of contraception in the management of breeding programmes grew, the Advisory Group expanded its services and membership. Home to the Advisory Group's co-chairs, the St. Louis Zoo has contributed funds and resources to its operation. In 2000 the AZA selected the St. Louis Zoo as the site for the newly commissioned WCC. The WCC includes scientists, veterinarians and animal managers with research and management expertise in wildlife contraception.

The Zoological Parks Board of New South Wales and the Australian Registry of Wildlife Health

This registry was established by Dr Bill Hartley in 1985 to build a collection of information and materials relating to healthy and diseased native fauna and zoo animals. Dr Hartley began operating the registry using a highly effective logbook and card-file system; since 1998, an archival database programme has been used to enhance this already comprehensive data set. The registry is the only one of its kind in the southern hemisphere and serves as a significant national and international resource for understanding the health of Australian ecosystems. It is continually used by people in both the private and public sector, including university veterinarians and biologists, as a source of information for understanding and controlling outbreaks of disease in native fauna and zoo animals. In addition, its extensive collection of normal tissues is invaluable for people carrying out research into native fauna. Access to materials within the registry is free to people interested in the study of wildlife health.

3.6 Encouraging participation

Broad participation in science and research brings together greater awareness of methods, requirements and benefits. All areas of zoo or aquarium operations, as well as conservation outreach programmes, will benefit from research, and all staff should be involved, either directly by participation or indirectly by being informed. Collaboration between institutions is essential.

Effectively harnessed, the global network of WAZA offers a huge research resource for universities and research institutes as well as for the zoo and aquarium community itself. Carefully designed and executed research projects that operate across zoos and aquariums, providing for the involvement of both large and small institutions, will benefit from increased sample sizes as well as opportunities to assess the influence of a wider range of variables than would otherwise be possible. This can improve quality and accuracy of results. Collaboration between zoos and aquariums on *in situ* science and research programmes can ensure better and more secure resources for those projects, as well as providing opportunities for contributions from smaller institutions, many of whom would be otherwise unable to establish and fund their own field involvement. Figure 3.1 shows a template for how cooperative efforts between zoos and aquariums, and universities and research organizations, can promote scientific studies even within institutions that lack in-house scientific staff and laboratory facilities.

Zoos and aquariums should encourage wide participation in science and research by:

- ensuring that this strategy document is provided to all new staff, as part of their induction;

- ensuring that basic experimental design, analysis and presentation of results are included in training courses tailored to zoo and aquarium staff;
- promoting opportunities for staff to work with science and research practitioners both *in situ* and *ex situ*;
- using regional collaborative networks of zoos and aquariums to increase project sample sizes and therefore the quality and accuracy of results;
- working individually and collectively, and in partnership with research institutions, to give students coordinated and supervised access to zoo and aquarium animals.

This last area can have a double benefit: helping to further institutionally, regionally and/or globally agreed research priorities, and helping to train the wildlife biologists of the future.



WAZA Project 03002: Blood sampling a reintroduced Przewalski's horse (*Equus przewalskii*) at the Gobi B, Mongolia. Photo: Christian Walzer, ITG

3.7 Funding

More funds must be made available for zoo and aquarium research. Much of the cost of research in zoos and aquariums is paid for by the institutions themselves, and the amount of money available for research varies significantly between them.

3.8 Dissemination of findings

The results of research, and developments in the application of science, must reach those involved directly in its application. This has implications for both where and how results are documented and distributed. The way that results can be made available, and in some cases interpreted for those zoo and aquarium practitioners, needs careful thought.

All zoo and aquarium-supported researchers and research networks should:

- encourage the publication of their results, at least in summary form, in the journals of the zoo and aquarium profession, as well as in the literature of the appropriate scientific disciplines;
- present their work regularly at zoo and aquarium symposia, workshops, and conferences;
- make available to the wider zoo community, work of practical relevance to conservation published in specialized journals or in scientific books; this can be achieved by publishing summaries and reviews in widely read zoo literature, such as the International Zoo Yearbook, and association journals;

- make sure that all *in situ* research work and results are made available in the region where the work took place, and in the local languages.

Results that are published in scientific books and journals should also be made available to the whole zoo and aquarium community, in order to provide the information that will allow an evaluation of the practical relevance of research results. It is, however, obvious that most zoos and aquariums do not have a large team of experts who can evaluate what are often very specialized publications in the scientific literature.

Box 3.4 lists a number of publications that include zoo and aquarium research, sometimes in summary or non-technical form. This is not a complete list.

In many cases, results of research in zoos and aquariums remain in the form of internal reports and are not freely accessible as publications. These reports often include information that is of direct practical use, potentially valuable for further or similar studies or of interest to other institutions.

Box 3.4

Publications and Organizations Disseminating Zoo and Aquarium Research Findings

- Animal Conservation
- American Zoo and Aquarium Association Conference Proceedings (Annual and Regional)
- Australasian Regional Association of Zoological Parks and Aquaria (ARAZPA Newsletter, website)
- Bongo (Journal of Berlin Zoo)
- CEPA Magazine (Association CEPA, France)
- Conservation Biology
- de Harpij (Dutch/Belgian Animal Keepers Association)
- Der Zoologische Garten (Journal of WAZA and VDZ)
- Dodo (Journal of the Durrell Wildlife Conservation Trust)
- European Association of Zoos and Aquaria (EAZA Research Committee Newsletter; website)
- Federation Research Newsletter (BIAZA)
- Gazella (Journal of Prague Zoo)
- International Zoo News
- International Zoo Yearbook
- IZW – Institut für Zoo und Wildtierforschung, Berlin (Conference Proceedings other publications, web site)
- Japanese Journal of Zoo and Wildlife Medicine
- Journal of Zoo and Wildlife Medicine
- Oryx: The International Journal of Conservation
- African Association of Zoological Gardens and Aquaria (PAAZAB News, website)
- Ratel (Association of British Wild Animal Keepers)
- South East Asian Zoos Association (scientific papers from conferences available on SEAZA website)
- Thylacinus (Journal of Australasian Society of Zoo Keeping)
- Wildlife Information Network
- World Association of Zoos and Aquariums (WAZA News, Magazine, Facts, Proceedings, and website)
- Zeitschrift des Kölner Zoo
- Zoo Biology
- Zoos' Print Journal (Zoo Outreach Organization)

Various specialty journals such as American Journal of Veterinary Research, Animal Behaviour, Journal of Herpetology, Journal of Mammalogy, and Reproduction also publish research conducted by zoo biologists.



3.9 Evaluation

Evaluation is critical in ensuring that research efforts remain focused on stated priorities, are adequately funded and are achieving their desired outcome. Frank and accurate appraisals should be undertaken regularly. Such appraisals will also help to iden-

tify where there are gaps in our efforts to promote the science needed for conservation, and will help identify where regional associations and others could most beneficially direct their resources.

Recommendations

The World Zoo and Aquarium Conservation Strategy (WZACS) urges all associations, regional and national, to continue to record and collate the research that their members undertake, to make that information accessible, and to monitor the emergence of new areas of science for their potential application to conservation.

The WZACS recommends that, for zoo and aquarium-directed research, institutions both individually and collectively identify, prioritize and pursue their own research needs.

The WZACS calls upon the international zoo and aquarium community to promote the establishment and widespread use of databases and resource banks to assist zoo conservation efforts. In particular, it calls upon the WAZA network and the International Species Information System (ISIS) to ensure that in its final form the Zoological Information Management System (ZIMS) is valuable, accessible and affordable for all WAZA members and for members of WAZA regional and national associations. Furthermore, it calls on all regional associations to promote universal participation in ISIS' ZIMS project.

The WZACS urges all zoos and aquariums to review their resources and contribute to the greatest extent and in as many ways as possible to research initiatives, especially those directed towards conservation. In addition, they should work both independently and cooperatively to obtain external research funding. To assist this effort, WAZA and regional associations should maintain information on available funding sources and the conditions for access.

The WZACS encourages zoos and aquariums and associated research organizations to analyse and publish their research results in peer-reviewed scientific journals, and to promote their results through the compilation and circulation of bibliographies and through short reports and reviews in relevant journals, newsletters and websites.

The WZACS calls for regular discipline-related reviews of zoo research to be undertaken at institutional, regional and/or global level. These reviews should assess and document progress with their identified research priorities and evaluate and redirect those priorities as needed.

The Waldrapp ibis (*Geronticus eremita*) is a critically endangered bird, with traditional migratory routes and destinations, which probably have to be mainly learned by juveniles migrating, at least once, with their parents. The "Scharnstein Project" (WAZA Project Nr. 03001) aims to teach a new migration tradition to groups of hand-reared Waldrapp ibises, using microlights to fly with them from Upper Austria to a suitable wintering area in southern Tuscany. In the following spring it is hoped that the birds will independently return to Austria. If this project succeeds the knowledge gained could be used for the reintroduction of Waldrapp ibises to other parts of their original range. The project and the bird have become well known due to positive coverage by TV.

Photo: Johannes Fritz, Scharnstein



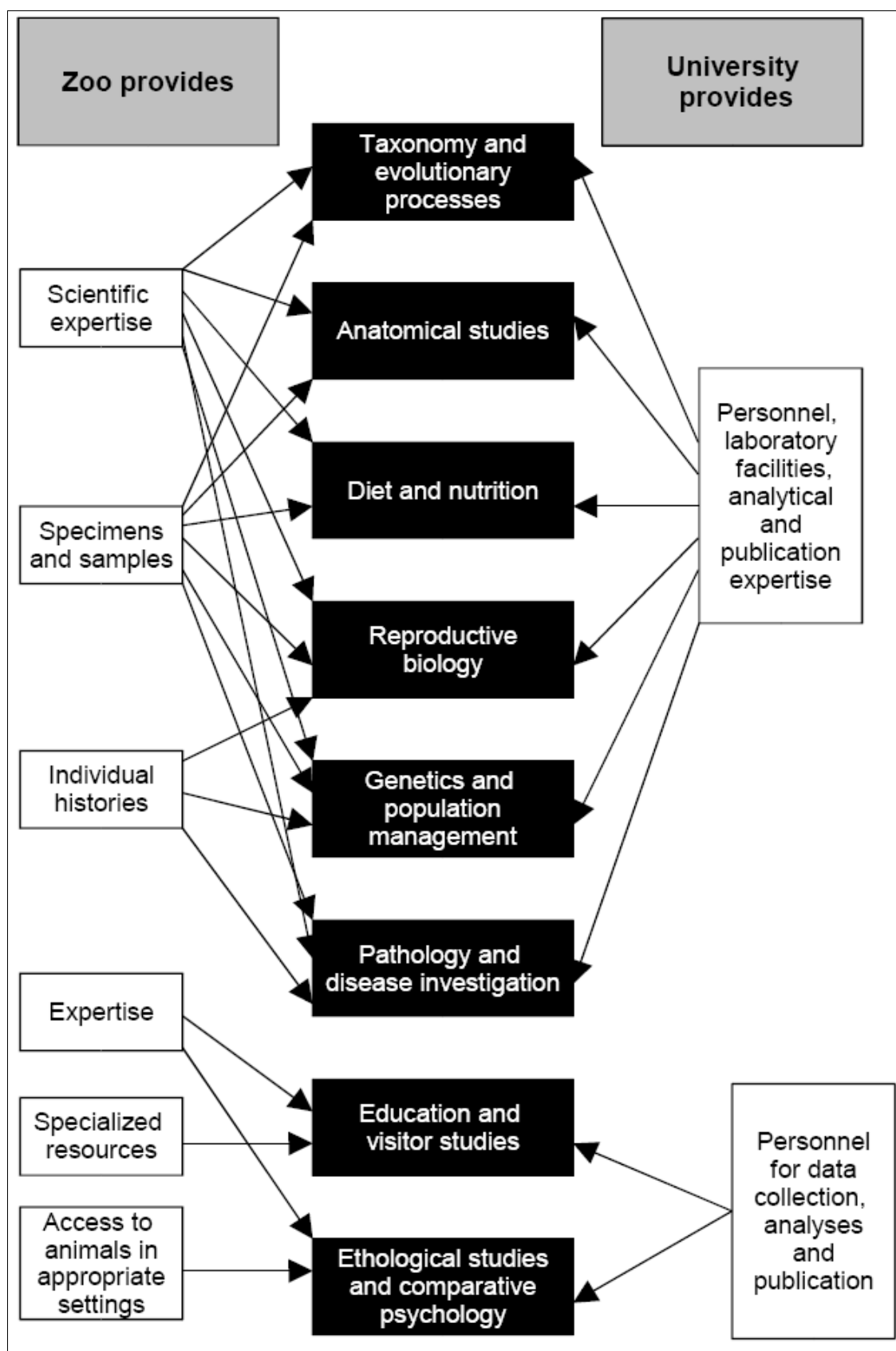


Figure 3.1 Patterns of cooperative effort between zoos, universities and research organizations



Topic	Anatomy and morphology	Bio-geography	Ecology	Education	Ethology	Genetics	Nutrition	Physiology	Population biology	Social science	Systematics and taxonomy	Veterinary medicine
Ageing	X		X		X	X	X	X	X			X
Animal welfare	X		X		X		X	X				X
Behaviour			X		X	X	X	X				X
Biomaterial banking		X				X			X		X	X
Biotechnology	X					X	X	X				X
Contraception	X				X			X				X
Dietary studies	X		X		X	X	X	X	X		X	X
Disease	X	X	X		X	X	X	X				X
Domestication	X		X		X	X	X	X	X			
Environmental enrichment	X		X		X		X	X				
Husbandry	X		X		X	X	X	X	X			X
Identification	X				X	X		X			X	
Life history	X	X	X		X	X	X	X	X			X
Population management		X	X		X	X		X	X		X	X
Reproduction	X		X		X	X	X	X	X			X
Taxonomy	X	X			X	X		X			X	
Visitor studies				X	X					X		

Table 3.1 Basic and applied research in zoos and aquariums: primary disciplines involved in studying priority topics.

The St. Louis Zoo has established the WildCare Institute as a internal facility dealing holistically with conservation issues, in partnership with other institutions. In order to promote conservation-relevant science and research, twelve centres have been established under the Institute, including:

- the Center for Avian Health on Galapagos (WAZA Project Nr. 04019), where the health of the unique avifauna of the archipelago is studied,
- the Center for Conservation of the Humboldt penguin (*Spheniscus humboldti*) in Punta San Juan, Peru (WAZA Project Nr. 04025), where biological data on the largest penguin colony of Peru are collected, and
- the MesoAmerican Conservation Center at the Bosawas Biosphere Reserve of Nicaragua (WAZA Project Nr. 04018) for studying the fauna present in the reserve, land-use patterns, human pressure on hunted species, etc.

Photo: Slaty spinetail (*Synallaxis brachyura*) caught in the course of a bird survey at Bosawas. Cheryl Asa, St. Louis



Chapter 4

Population Management



Summary

This chapter presents a vision of the involvement of zoos and aquariums, as centres of expertise in small population management, in regional or global cooperative breeding programmes. To maximize value to conservation, ex situ populations need to be demographically stable, well-maintained and capable of self-sustaining reproduction. They should be distributed among several institutions and of sufficient size to maintain high levels of genetic diversity. However, many programmes have too few founders and participating institutions, depleted genetic diversity and/or poor breeding success. Strategies to enhance viability include: increasing breeding spaces, expanding from regional to global programmes, increasing the intensity of genetic management, improving husbandry practices through research, and importing founders from the wild or other regions. Population management includes demographic and genetic management, veterinary care and husbandry. The first involves monitoring numbers, and age, social and sex structure. Genetic management involves verifying taxonomic identity, and avoiding deleterious effects of inbreeding and loss of genetic diversity. Management decisions are developed through stud-books. Population data are held on a database system at the International Species Information System (ISIS), supported by registration and analysis software. Other management aspects discussed include confiscated and abandoned animals, ownership, and the impact of regulations on animal transfers. The chapter emphasizes that a primary goal of ex situ programmes is support (including demographic and genetic reservoirs) for in situ conservation. Metapopulation management involves managing a set of interacting populations under a common conservation goal. Its components may include ex situ populations, in-country breeding programmes, wild populations and genome banks. Transfer between populations may involve reintroduction. The chapter ends by stating that many wild populations are like ex situ ones - of small size with limited gene flow between them. The science of small population management developed primarily for managing ex situ populations is thus of direct relevance to field conservation. This expertise is a major contribution that zoos and aquariums can offer conservation.

Vision

All zoos and aquariums will be primary centres of expertise in small population management and will be involved in global or regional cooperative breeding programmes. All such programmes will be based on sound knowledge using the latest available data on population management, reproductive biology, genetics, behaviour, physiology, nutrition, veterinary care and husbandry.

4.1 Introduction

Zoos and aquariums in the future will be critical for the survival of many species and an integral part of *in situ* conservation programmes for many others. However, animal collections in individual zoos and aquariums are typically too small to be of much value to long-term conservation. How then can these individual collections serve a conservation purpose? The answer will lie in cooperative international or regional *ex situ* breeding programmes to form large, viable populations. These cooperative breeding programmes serve many purposes: providing animals for public educational and/or exhibit opportunities; providing fund-raising material; providing research collections from which to gain basic knowledge of animal biology and

husbandry; and, on a larger scale, providing demographic and genetic backup to wild populations. To serve in all of these roles fully, these populations must be viable over the long term. This requires that they be:

- demographically stable;
- healthy, well maintained and capable of self-sustaining reproduction;
- distributed among several institutions to lessen the risks of catastrophic loss;
- of sufficient size to maintain high levels of genetic diversity.



Demographic stability is needed to ensure that an adequate number of animals of breeding age are available to reproduce at the rates needed to increase or maintain the population at its desired size. Healthy populations are needed to ensure that animals are capable of breeding when needed. Genetic diversity

is required for populations to remain healthy and adapt to changing environments (i.e. experience natural selection). *Ex situ* breeding programmes need to preserve this diversity, otherwise the long-term fitness of these populations will be compromised.

4.2 Maintaining viable populations: setting population goals

Conservation biologists have recommended that to be viable, *ex situ* populations should be of sufficient size to retain 90% of the source species' genetic diversity for 100 years. They argue that the sizes needed to achieve this goal will also underlie most other concerns of viability (capacity for reliable reproduction, demographic stability, etc.). The optimum population size depends on the specifics of each population (e.g. species with longer generation lengths or more genetic diversity will require smaller populations) but will typically be in the several hundreds. This clearly illustrates the need for individual institutions to link to global and regional cooperative breeding programmes.

The '90%/100 Year' goal is limiting as it focuses only on genetic criteria for viability. A more comprehensive approach should consider overall population viability. Target population sizes would be set to match a multi-dimensional set of criteria that would include minimizing the probability of extinction, retaining high levels of genetic diversity, maintaining a self-sustaining population and meeting other needs (e.g. exhibit needs, social/behavioural needs of animals, or supply of animals

for reintroduction). Future population planning should consider this approach, and tools need to be developed to conduct these population viability analyses.

Many *ex situ* breeding programmes will not be able to meet general criteria for viability. This is typically due to too few founder animals, already depleted genetic diversity, not enough participating zoos, or a lack of breeding success. Each programme should identify strategies for enhancing the viability of its populations, including:

- increasing breeding spaces allocated to the species, perhaps in off-exhibit facilities;
- expanding a regional to an international programme;
- increasing the intensity of genetic management (e.g. by encouraging tighter compliance with breeding recommendations);
- improving husbandry practices or investing in husbandry, behaviour, nutrition and veterinary research to improve reproductive performance;
- importing additional founders from the wild or other regional programmes.

4.3 Science of population management

Population management includes demographic management, genetic management, veterinary care and husbandry. Coordination among these fields is absolutely necessary since each places constraints on the others. For example, husbandry and behavioural concerns often limit genetic management, and veterinary concerns may remove animals from breeding situations or prevent some desired transfers between institutions.

Demographic management is concerned with monitoring the age, social and sex structure of the population, and number of conspecifics, to ensure reliable reproduction, as well as determining the number of animals that need to be bred to achieve a desired growth rate. Analytical software using studbook data is used to estimate this. Two major concerns facing demographic management are managing population growth rates and limited resources.

As populations grow animals may need to be sent to other responsible zoos and institutions, and reproduction limited, ideally to achieve zero population growth. This puts considerable strain on population management, since placing animals in non-breeding situations is often difficult from a husbandry perspective; it may take up valuable space and be unnatural with

regard to normal social groupings. While contraceptives have frequently been used to regulate reproduction, this is often not ideal and can lead to health and social problems in some species. Nevertheless, contraceptives are the primary method used to control population growth in many zoos, and further research is needed to develop safe, reversible contraceptives for the large variety of species under zoo care. Euthanasia can be another method of population control for some populations, but not all, and may raise ethical and cultural concerns. (See also Chapter 9.)

Limited resources, particularly enclosure spaces, also place constraints on population management. While scientific criteria can be used to determine ideal population sizes, for many species there are simply not enough enclosure spaces available, even on a global scale, to establish viable long-term populations.

Genetic management is concerned with verifying the taxonomic identity of animals, and designing breeding programmes to meet the primary genetic challenges facing zoo populations: the deleterious effects of inbreeding; genetic adaptation to the zoo or aquarium environment (akin to domestication); loss of



genetic diversity; and the appearance of deleterious traits. Breeding strategies the primary objectives of which are to minimize loss of genetic diversity (e.g. minimizing mean kinship) in general, address all of these concerns.

Two major challenges to genetic management are uncertainty of the taxonomic status of specimens due to lack of information on their place of origin, and lack of information on relationships among individuals because of missing pedigree information. Inexpensive molecular techniques (e.g. mitochondrial DNA and microsatellite nuclear DNA analysis) are now available for evaluating the systematics of living collections using easily collected samples such as hair and faeces. No doubt the future will bring more techniques that will continue to simplify these analyses, making them increasingly available to institutions worldwide.

The best breeding strategies for maintaining genetic diversity have been developed for populations where relationships among individuals are known and can be calculated from complete pedigrees. However, it is difficult to apply these strategies to populations where parentage is uncertain. Molecular genetics can be used to resolve many of these unknown relationships if there is enough genetic variation and if the critical animals (potential parents and offspring) are still accessible for genetic sampling. When there is little genetic variation, or when samples from key individuals are not available, molecular genetics is often of little help in defining relationships among individuals.

In populations with incomplete pedigrees or species that live in groups where individuals are difficult to distinguish (e.g. in aquariums, in some *ex situ* populations), managing the group, rather than individuals, is often the only option. Population managers are just beginning to develop and evaluate strategies for these group situations. In the future, population management will rely heavily on group management strategies for many populations, both *ex situ* and *in situ*.

Two other genetic issues will become increasingly problematic in future population management. These are the problems of adaptation to the zoo or aquarium environment and the likely increase in appearance of deleterious traits as populations become more inbred.

Genetic adaptation to controlled breeding has long been recognized as an important consideration in population management, yet it is not well understood. Artificial selection, conscious or unconscious, will tend to domesticate animals to some extent over time. Traits under selection may be subtle though significant, such as a decreased fear response, decreased aggression, or digestion efficiency of an artificial diet. Collection-based environments as well as husbandry techniques have the inadvertent potential to duplicate some of the criteria intentionally used in artificial selection of domesticated stock. This is one of the main reasons that breeding decisions should be based

on pedigrees, using strategies like mean kinship to maximize genetic diversity, rather than based on selecting for certain traits. Despite these breeding strategies, artificial selection is still likely to be occurring. Future research will be needed to better understand the potentially critical effect artificial selection has on the long-term future of zoo-based populations and how they contribute to successful conservation of the species (e.g. success of reintroduction programmes).

The appearance of deleterious traits will be increasingly common as populations become inbred over time, as these deleterious recessive genes are a normal part of the genetic variation in populations. Managers must first determine if the appearance of unhealthy traits is due to genetics or environmental effects. Managers should also not immediately assume that the most appropriate strategy is to select against known and potential carriers of the trait. Doing so risks simultaneously removing other desirable genetic variation in the population. Pedigree analyses should be conducted to determine the best strategies for dealing with deleterious traits that appear as populations become increasingly inbred.

Population management cannot succeed without sound veterinary and husbandry management. Successful reproduction usually requires healthy, well-cared-for animals in appropriate environments. Behavioural needs of animals must be met through correct social group structure, exhibit design and enrichment programmes. This is likely to require behavioural research, especially for little-known species. Movement of individuals between institutions intensifies veterinary concerns. Animal transfers are a critical component of population management and involve significant risks of spreading disease. Most species of animals have co-evolved with a suite of organisms that may or may not cause a high level of morbidity or mortality. This normal situation may be altered by placing animals in sub-optimal situations (physically, psychologically, nutritionally, etc.) or by exposure to new pathogens from other species (including humans) or conspecifics originating from a different location. Uncompromising care must be taken to reduce exposure of animals to other species or organisms that they would not naturally encounter. Assessing new pathogens requires ongoing research and screening programmes. Zoos and aquariums need well-managed quarantine facilities and protocols to address these concerns adequately.

As with population management in general, regional or multi-institutional approaches to health screening and management can enhance success and reduce the risks and burden of effort on a particular institution. A tremendous and growing body of knowledge is available through networks of health professionals, such as the IUCN Veterinary Specialist Group, an international network of wildlife and zoo veterinarians, and regional zoo vet organizations (e.g. American Association of Zoo Veterinarians and the European Association of Zoo and Wildlife Veterinarians).



4.4 Population management tools: databases, ISIS, studbooks and ZIMS

Each zoo or aquarium participating in a population management programme needs to record information on individual animals in its collection in the same manner, using standardized software packages, e.g. Animal Record Keeping System (ARKS) developed by ISIS. The basic data recorded will include place of origin, dates of birth and death, parentage, and offspring, but also information on diet and feeding, health, medical treatments, and breeding habits. This information is essential for a population management programme and often also provides details of the basic biology of little-known species.

ISIS provides the central computer base for animal records collected from, and shared by, its world membership of over 600 institutions (Box 3.2). By using ARKS, member institutions can electronically transfer data direct to the ISIS database.

Records for particular species are also kept in studbooks, either internationally, regionally or nationally. Studbooks are often the most accurate datasets for species because they are maintained by a studbook keeper who is responsible for collecting, verifying, editing and publishing the studbook. International studbooks come under the jurisdiction of WAZA, and regional or national studbooks are the responsibility of the relevant zoo

association. ISIS annually produces and distributes a CD-ROM that contains the latest editions of studbooks sent in by studbook keepers. The 2003 Studbook CD-ROM contained data from 281 institutions in 47 countries and lists 903 regional and 167 international studbooks, plus 87 husbandry manuals. This is a considerable increase since the 1993 World Zoo Conservation Strategy and is partly a reflection of an increase in questionnaire response but it also reflects a real increase in the number of studbooks.

In addition to the software used to manage animal data, there are various specialized software packages for analyzing studbook data and developing management recommendations, e.g. REGASP, PM2000 and MateRx.

The current system of maintaining multiple duplicate databases is an inefficient use of resources and there is now an exciting new development, to be run by ISIS, for a comprehensive and integrated web-based information system to support a wide range of animal management and conservation activities. This system, the Zoological Information Management System (ZIMS), will be accessible online and through stand-alone record keeping stations. (See Chapter 3, and Box 3.2)

4.5 Organization of cooperative breeding programmes

Cooperative breeding programmes can be organized and administered at global or regional levels. Regional programmes are often preferred as animals are usually more easily transferred within regions (e.g. within the European Union). Zoos and aquariums in different regions may have different conservation priorities.

Several regions also actively develop regional collection plans that identify priority taxa to breed and to allocate regional resources. Target population sizes are defined for each taxon in the plan to optimize the use of zoo spaces, and participating institutions incorporate these regional collection plan guidelines into institutional collection planning. Priorities for selecting species may include many factors such as:

- degree of threat to the wild populations, i.e. IUCN categories of threat;
- taxonomic uniqueness;
- species native to a region;
- species with established husbandry protocols;
- species with already established and healthy populations;
- flagship species;
- educational and research value.

The software REGASP (Regional Animal Species Collection Plan) was developed by the Australasian Regional Association of Zoological Parks and Aquaria, to assist zoos with institutional collection planning. REGASP combines information from institutional animal records with data on regional collec-

tion goals so that zoo and aquarium managers can find regionally and globally produced collection recommendations during their planning process. REGASP is distributed worldwide as part of the ISIS suite of animal management software.

The IUCN Species Survival Commission has a network of Specialist Groups which deal with particular taxa and assist in setting priorities for conservation activities.



Critically endangered California condor (*Gymnogyps californianus*) bred by AZA zoos under a Species Survival Plan have been successfully returned to the wild. Photo provided by Mike Wallace, Zoological Society of San Diego.

4.6 Global cooperative breeding programmes

Global cooperative breeding programmes, which exist for some species, have international studbooks and an international species coordinator, who evaluates the roles of individual animals, institutions and regions from a global perspective. These programmes may be operated under the authority of a national government that may own all or most of the animals in the breeding programme.

Global programmes can maximize the management potential of collection populations by avoiding possibly conflicting or even competing goals and recommendations among regions. For example, attempts to establish regional programmes for some species in range regions could be jeopardized by the removal of genetically important animals to supply programmes in other re-

gions. Likewise, one regional programme may send surplus stock (and genetically unimportant animals) to other regions that, when they mobilize their resources to set up their own regional management programmes, suddenly discover that their founder stock is of little genetic value from a global perspective. In some taxa, it may be that a coordinated effort by several regions is needed to maintain a healthy and viable population. In other cases, each region may be able individually to maintain a viable population of one subspecies or species of a broader taxon for which several taxa are in need of management. Coordinated allocation of resources among the world's zoos and aquariums is needed to avoid fragmentation of resources or unnecessary duplication of effort.

4.7 Ownership and population management

Ownership of animals continues to be an important aspect of the structure and implementation of cooperative breeding programmes. With some programmes, ownership remains with the government of the range states and the original stock and all descendants are on loan; ownership is therefore not usually an issue in population management. Other programmes make animal transaction recommendations but ignore ownership, leaving it up to the individual institution involved to determine if animals are lent, traded or sold/purchased. The benefits of lending animals include retaining ownership of genetically valuable specimens and engaging in reciprocal loan agreements between institutions, thereby increasing access to a larger variety of specimens for the collection.

Some zoos however, have to rely on the revenues from the disposal of animals to finance, at least part of, their breeding programmes. This complicates transactions between institutions

and may limit the efficiency of cooperative breeding programmes, as these zoos may prefer to sell animals rather than turn them over to the coordinator's management authority. Strong conflicts of interest may develop in zoos and aquariums with high financial interests in the population under management. They may be unwilling to follow through on recommendations to stop breeding, or to send specimens to other institutions to breed with non-owned specimens. These issues are particularly pertinent when cooperative breeding programmes include private individuals. Species coordinators need to evaluate the costs and benefits of including in the programme those institutions, public or private, with commercial interests in the species being managed. While such participants may hold and make available (at a cost) genetically valuable stock, their commercial interests may otherwise complicate or even damage the credibility of the programme. (See also Chapter 9.)

4.8 Confiscated and abandoned animals

A problem for some breeding programmes is confiscated or abandoned animals. These may have been illegally held as pets or confiscated as illegally imported. They may be animals rescued and turned over to wildlife authorities or they may be problem wild animals removed by wildlife authorities to avoid human/animal conflicts. When assimilating confiscated and abandoned animals into a breeding programme the following points should be considered:

- questionable health, disease risks;
- questionable origin because of lack of a life history (wild born, wild-caught, taxonomy);
- questionable relationships among individuals in confiscated groups.

On the other hand, healthy confiscated or rescued wild-caught animals can provide a breeding programme with an opportunity to refresh the founder stock, or replace post-reproductive old animals with young breeders. Most breeding programmes have not been established with an adequate number of founders and the periodic inclusion of new unrelated animals may be a bonus for such programmes. Every effort must be made, however, to ensure that any individuals that are included are healthy, of known taxonomy, wild born (or, if collection born, their relationship to the population is known) and appropriately placed. WAZA and the IUCN have developed detailed guidelines for zoos and aquariums, and wildlife authorities, for dealing with confiscated animals (available from WAZA, and at the IUCN web site www.iucn.org).



4.9 National and international regulations

Intensive population management serving conservation goals requires transfers of animals. This includes: exchanges of animals between the sub-units of the *ex situ* population; introduction to existing *ex situ* populations of animals from the wild for genetic reinforcement; establishing new *ex situ* populations with wild animals; and the interactive exchange of animals between *in situ* and *ex situ* populations for mutual reinforcement. Many of these transfers - planned in the framework of species conservation - involve the crossing of national and continental borders.

Zoos and aquariums must comply with national and international legislation with respect to animal transfers. However, for the sake of effective population management, which is crucial to species conservation, existing and pending legislation should be adapted and developed to leave open ample possibilities for the transfer of animals and genetic material between registered zoos and aquariums and between *in situ* and *ex situ* populations. It is the processes required for the implementation of leg-

islation, such as those listed below, that can unfortunately be time-consuming and complicated, and thereby cause unnecessary delays:

- CITES regulations and related national and international legislation, regulating imports and exports of animals of endangered species;
- national legislation restricting the imports of animals (both domesticated and wild) in order to prevent the introduction of diseases;
- national legislation or conservation codes regarding the removal or reintroduction of animals from or to a natural habitat;
- national legislation developed as a result of the Convention on Biological Diversity (CBD) concerned with the control of bio-piracy, and a nation's sovereign rights over biodiversity;
- national legislation aimed at preventing the introduction of alien species that have invasive potential.

4.10 *In situ* and *ex situ* population management: metapopulation management plans

A primary goal of cooperative *ex situ* breeding programmes for threatened and endangered species is to support *in situ* conservation. This may be through rescue of species imminently threatened with extinction in the wild, through research, educa-

tion, or promotion efforts that support *in situ* populations, or simply as genetic and demographic reservoirs serving as back-ups for endangered wild populations.

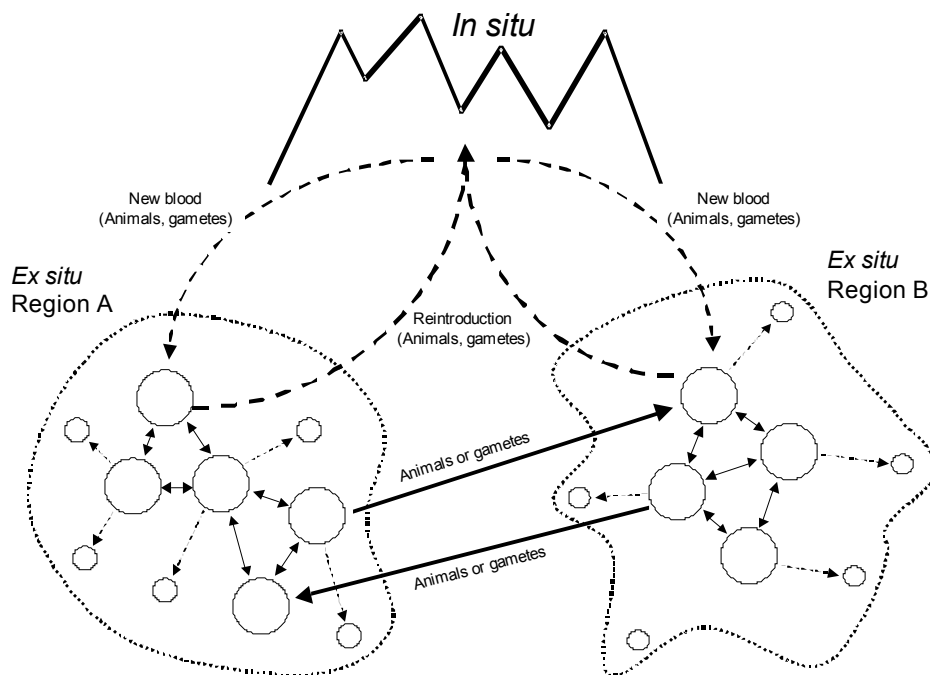


Figure 4.1. Metapopulation management involves managing a set of interacting populations, both *in situ* and *ex situ* under a common conservation goal. This may involve any number of components: exchanges among larger breeding institutions (large circles); disposition of post-reproductive or non-breeding animals in peripheral institutions (smaller circles and dotted lines); transfer of animals between regions; reintroduction of zoo-born animals into native habitats; and periodic transfer of wild animals to the *ex situ* population. With future advances in reproductive technology, transfer of genes among units of the metapopulation could be through animal or gamete transfer.

A useful model for describing the potential relationships between *ex situ* and *in situ* population management is the metapopulation management model, a set of interacting populations being managed under one conservation goal (Figure 4.1). Components of a metapopulation management plan may include multiple regional *ex situ* populations (or a global *ex situ* population), in-country breeding programmes, multiple wild populations, reintroduced populations, vacant habitat suitable for reintroductions and even genome banks. Population management is accomplished through transfers between institutions in the *ex situ* population as discussed above, reintroduction of zoo-bred animals into the wild, translocation of animals among wild populations, and, for genes, artificial insemination, or embryo transfer technologies. The role of the *ex situ* populations can vary from simply serving as a static genetic and demographic reservoir for the species, with little interaction with wild populations, to populations with extensive gene flow in

both directions (reintroduction and periodic acquisition of new founders).

In situ populations often face problems similar to those of *ex situ* populations – small founder base and overall population size, limited gene flow, possible hybridization issues, overpopulation (exceeding carrying capacity) and the need for human intervention. The science of small population management developed primarily for managing *ex situ* populations will need to be applied to these *in situ* populations to enhance their viability. Zoos and aquariums will be in a strong position to supply this expertise and should look for opportunities to do so.

Reintroduction is an obvious and important component of the relationship between *ex situ* and *in situ* conservation, though it remains a challenging task. (See also Chapter 2.)

Recommendations

The World Zoo and Aquarium Conservation Strategy (WZACS) recommends that all breeding programmes for threatened species in zoos and aquariums be managed as global or regional cooperative programmes with participating zoos and aquariums sharing a set of specific programme objectives. Regional programmes should link together to address global conservation strategies. Global or regional studbooks or equivalent databases need to be maintained for these species. Where resources allow, breeding programmes for non-threatened species should also be monitored and managed.

The WZACS recommends that all breeding programmes in which zoos or aquariums are involved should be quantitatively and objectively evaluated in terms of their objectives, status and viability.

The WZACS strongly recommends that all breeding programmes should be based on sound science and management using the latest available knowledge on population management, reproductive biology, genetics, animal behaviour, nutrition, veterinary care and husbandry standards.

The WZACS reminds all zoos and aquariums and local, regional and national authorities that they would find it useful to consult the 'WAZA Guidelines on the acceptance of seized or confiscated animals' before accepting confiscated animals.

The WZACS urges all zoos and aquariums to continue to support the scientific development of population management, particularly for taxa held in group situations (e.g. fish, invertebrates and micro-organisms), or species facing specific challenges, such as disease.

The WZACS reminds all zoos and aquariums that they are expected to maintain critical animal records on their collections and contribute these data to the ISIS database and studbooks in a timely and comprehensive manner. The WAZA and regional associations must continue to explore economically viable methods for institutions in developing countries to participate fully in this process.

The WZACS calls on all zoos and aquariums to link their collection planning with regionally or globally identified conservation priorities working in collaboration with the IUCN Species Survival Commission's taxonomic and species advisory groups.

The WZACS calls upon legislators and enforcers to make sure that the processes of implementation involved in the transfer of animals and genetic materials between zoos and between aquariums are completed as speedily as possible.



Chapter 5

Education and Training



Summary

Education is a central role for all zoos and aquariums and should thus be part of their organizational strategy. This includes having a defined education policy, making a strategic development plan for education and demonstrating environmental sustainability (a 'green' ethos). Education goals should be integral to planning collections, designing exhibits, developing conservation programmes and planning visitor services. The educational role is to interpret living collections to attract, inspire and enable people from all walks of life to act positively for conservation. Educators interpret animals in their economic, cultural and political contexts, as well as biological ones, and explain human impact on wildlife in both local and global contexts. In order to do this education staff (and volunteers) should be supported through training. Networking through the International Zoo Educators Association and with counterparts in botanic gardens, museums, and science centres provides further opportunities to share methods. Zoos and aquariums undertake informal (free-choice) education with their visitors, and formal education through developing links with schools, colleges, universities and teacher training institutes. By participating in curriculum development, zoo and aquarium educators can keep their programmes up to date and help ensure that conservation is incorporated into courses. Living collections can be used well beyond biology, to teach animal care, horticulture, exhibit design, and leisure management; so developing training partnerships further expands educational roles. Education is also a critical component of field conservation, building awareness and support. The chapter thus presents a vision of zoos and aquariums making a significant conservation contribution by acting as leaders and mentors in socially- and culturally-relevant formal and informal education, thereby influencing people's attitudes and behaviour towards wildlife and environments, local and global.

Vision

Zoos and aquariums with their unique resource of live animals, their expertise, and their links to field conservation will be recognized as leaders and mentors in formal and informal education for conservation. The educational role of zoos and aquariums will be socially, environmentally and culturally relevant, and by influencing people's behaviour and values, education will be seen as an important conservation activity. Zoos and aquariums will expand the training of their own staff and of others engaged in *in situ* and *ex situ* work.

5.1 Introduction

Zoos and aquariums are excellent centres in which to inform people about the natural world and the need for its conservation. Awareness can be converted into action with positive benefits for wildlife, people and conservation. Educational activities in zoos and aquariums will help realize the vision of Agenda 21, an initiative of the 1992 United Nations Conference on Environment and Development in Rio Janeiro. The official description reads: 'Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts on the environment'. It is a large document and the original text, in Arabic, Chinese, English, French, Russian and Spanish, can be found, at: www.un.org/esa/sustdev/documents/agenda21/. Chapter 36 of Agenda 21 entitled 'Promoting Education, Pub-

lic Awareness and Training' provides an umbrella for all action related to education for sustainable development, including those foreseen by other UN conferences. Chapter 36 'encompasses all streams of education, both formal and informal, basic education and all key issues related to educating for sustainable human development, including environmental education'.

Progress in conservation depends upon the development of public understanding of the relationships between species, the environment and people's own attitudes and actions. The success of other conservation strategies, such as conservation management of *ex situ* populations, reintroduction and habitat protection, depend in the long term upon the influence of education on human behaviour.



Zoos and aquariums enable people to develop appreciation, wonder, respect, understanding, care and concern about nature. This can be achieved globally through the network of zoos and aquariums working locally, nationally, regionally and internationally, and via direct involvement in *in situ* and *ex situ* projects.

There is a need to develop further the potential that zoos and aquariums have for training — not just for zoo staff, but also for others involved in conservation, research, environmental management, education, community development and more.

Zoos and aquariums appeal to a very broad audience and have huge visitor numbers throughout the world. They therefore have the potential to be a very important source of environmental awareness, training and action for a sustainable future. In the early 21st century, we must make a concerted effort to revitalize and re-focus education and training programmes; develop appropriate resources; make direct links with *in situ* work; and engage with public needs, behaviour and aspirations. The aim should be for education to permeate all aspects of the zoo or aquarium's operation, no matter what its size, location or financial constraints.

5.2 Zoos and aquariums as learning organizations

Zoo and aquarium education is a holistic discipline targeted at visitors, staff and the wider community.

The educational philosophy of zoos and aquariums should incorporate the principles of environmental education and education for sustainability. This may be referred to as 'conservation education'. Zoos and aquariums should recognize the importance of providing basic information about animals and habitats. However, we must all understand that cultural, economic and political factors will influence the emphasis placed upon the variety of environmental and conservation issues in zoos and aquariums in different parts of the world.

Zoos and aquariums should recognize the importance of education by including it in mission statements, by ensuring that it is integral to the activities of the senior management team and by making sure that education goals are fully considered when planning collections, designing exhibits, developing conservation programmes and planning visitor services. All zoos and aquariums, and their associated regional organizations, should produce a written education policy and a strategic development plan for education. (See Box 5.1.)

Box 5.1

Education Standards

The standards summarized here were adopted by the Council of the European Association of Zoos and Aquaria (EAZA) in September 2001. Other regional associations have also developed education standards for their member institutions. The achievement of these standards will enable members to enhance their professionalism and network together continually to improve their educational role and effectiveness.

Summary of the EAZA Education Standards (2001)

1. The education role of the zoo is to be clearly stated in its written mission statement.
2. The zoo must have a written education policy identifying components and setting out the methods by which these components are directed towards the different sections of the zoo's visitor audience. Zoo education should target all visitors, not just schools.
3. The zoo must demonstrate that it is carrying out its education policy, by reference to specific projects, attendance figures, evaluation procedures and research.
4. At least one member of staff within the institution should be responsible for professional implementation of the education policy.
5. Enclosures must clearly and correctly identify the animals in them. Signs should highlight threatened species and species in regional, national and international coordinated breeding programmes.
6. When animal demonstrations form part of the programme, they must contain an education or conservation message.
7. For education programmes to be successful, zoos must exhibit animals in the best conditions possible, in enclosures that enable them to live as naturally as possible and to exhibit natural behaviour as far as possible.
8. Interpretation and education should be an integral part of zoo exhibits; the educator should be involved in the exhibit planning and collection planning process.
9. A reference library appropriate to the size and complexity of the zoo should be maintained and made available to all staff members, and possibly to the public where practicable.
10. Resource material and education information should be made available to the general public and zoo audience. This might include leaflets, guidebooks, teachers' notes, resource packs and worksheets, which should be displayed and available.



Zoos and aquariums should also make a suitably qualified member of staff responsible for developing and overseeing educational activities, and should make sure that trained staff and/or volunteers are available. Where possible, they should employ ‘educators’ and should develop education centres or similar educational facilities.

5.3 Networking

Education and other staff should be encouraged to participate in local, national, regional and international networks such as the International Zoo Educators Association (IZE) and its regional groups. The sharing of ideas, whether face to face or via written or electronic means, is an essential part of maintaining

an effective education base. Zoos and aquariums should encourage educators, and give them the means, to engage in such productive dialogues, not just with fellow zoo educators but also with their counterparts in botanic gardens, museums, science centres and other relevant institutions.

5.4 Living exhibits

Living animals have an enormous power of attraction; seeing, hearing and smelling them has huge educational significance in itself. The primary goal of living exhibits is education and educators should be involved in the design of the exhibit. With an increasingly urbanized population, this contact with nature is of vital importance and we should build on it to promote and support conservation. For example, we can display animals in more natural settings, use appropriate mixed exhibits and/or provide contextual story-led or message-driven experiences, using a variety of interpretation techniques.

The design of exhibits based on habitat should include aspects of human culture appropriate to the species, and make use of plants, and features such as sound and climate. Visitors will then more easily understand the concepts of biodiversity and the interdependence of species, habitats and ecosystems, and recognize the links with human actions.

Zoos and aquariums should recognize that the visitors’ experience is also affected by the welfare of the animals and their enclosures. Zoos should therefore ensure that positive educational messages are not compromised or confused by poor conditions or poor husbandry.

5.5 Informal education and self-directed (free-choice) learning

The majority of visitors wish to have a day of recreation and fun and there needs to be a range of educational approaches providing access and opportunity for all, regardless of age or ability.

Within the visitor audience, there are various target groups that provide opportunities for focused conservation education — for example, decision makers, business leaders, consumers, parents, teachers, students, and children. Groups from a wide range of social, cultural, ethnic and economic backgrounds visit zoos and aquariums.

Visitors are open to receiving information about animals, and are often more receptive to an informal approach. Informal education (e.g. keeper talks, close encounters, hands-on experiences, exhibits that allow visitor access, exhibits with a clear biological theme) is enhanced if the educational and conservation ethos permeates the organization and its staff. Education is more effective when the organization adopts the ethic of ‘prac-

tise what you preach’; this can be seen if the organization operates in as ‘green’ or sustainable a way as possible. (See also Chapter 8.)

The educational aims of zoos and aquariums should include the following:

- to excite, enthuse and interest people about the natural world;
- to encourage understanding of conservation issues and visitors’ individual roles in them;
- to develop public support and action to address conservation concerns at a variety of levels;
- to provide a range of experiences, materials and resources for the diversity of visitors, to enable them to make informed choices in their daily lives which benefit the environment and wildlife;
- to develop a sense of place as humans in the natural world and an understanding of the relevance of conservation to everyday life.



5.6 Formal education

All zoos and aquariums should attract groups from a variety of educational institutions. By provide exciting, interactive, structured educational workshops, programmes or classes and resources, tailored to meet the specific needs of these groups, zoos and aquariums can contribute to learning and understanding as part of local and national curricula frameworks. At the same time, zoo educators can raise the profile of environmental and conservation issues and advocate positive attitudes about and action for nature from schools, colleges and universities into the community.

Zoo and aquarium education staff should develop links and partnerships with teachers to ensure that zoo educational programmes are up to date with curricula developments. Well-tailored education activities may thereby attract support from education authorities, while also demonstrating the important educational role of zoos and aquariums in their local community, and as part of a wider global network.

5.7 Education themes

Many zoos and aquariums have particular themes or specialties — for example, focusing upon a local species, a taxonomic group or a biogeographic region. The educational focus should induce a feeling of wonder and respect for the web of life and our role in it; it should engage the emotions and build on this experience to create a conservation ethic that can be carried into action. This can be summarized as ‘attract, inspire, enable’.

Zoos and aquariums can use a variety of methods to engage their visitors’ curiosity about wildlife. Visitors should be able to learn about species, their habits, behaviour and conservation, and be inspired to find out more. They should be encouraged to understand the importance of ecosystems, the socio-economic value of species and habitats and the impact of hu-

Zoos and aquariums should recognize the concept of lifelong learning and target students from a wide range of ages and abilities — from pre-school to university, and students with special educational needs. Additionally, zoo educators or specifically trained staff may advance the objectives of conservation education by working in the community — visiting schools, orphanages and old peoples’ homes, or assisting with local environmental projects.

The objectives of formal education may be promoted through programmes specifically aimed at training teachers, and by assisting curriculum development bodies to ensure that the roles of zoos and of conservation issues are incorporated into courses. The whole zoo or aquarium should act as a living classroom with specific on-site courses, and the organization should pursue opportunities for partnerships with local colleges and other educational institutions or agencies.

man behaviour upon wildlife and the environment. Zoos should also enable visitors to take action and recognize their responsibilities for the world we all live in.

Various biological themes may be explored, including such complex concepts as population dynamics, anatomical and physiological adaptation, evolution and natural selection, conservation breeding and conservation management techniques. However, zoos should recognize their broad appeal and explore other educational themes appropriate to their audience — for example, the importance of some species in cultural and religious beliefs, the domestication of species, aspects of good husbandry and the inappropriateness of keeping certain exotic animals as pets.

5.8 Wildlife conservation advocacy

Zoos and aquariums are ideally placed to encourage public support for conservation campaigns, action and political advocacy. Through focused activities, displays, campaigns and information about the choices people can make in their everyday lives, zoos can help visitors make a difference to wildlife.

For some visitors, zoos may be the primary source of information about wildlife, its legal protection and alternative values placed upon nature. Zoos have an important opportunity to promote moral responsibilities and to change behaviour and values.

Wherever possible, zoos and aquariums should make environmental issues relevant to visitors by relating the issues to their own lives and experience. For example, the illegal bushmeat trade in Africa may be compared to over-fishing in Europe. In this way, visitors to European zoos and aquariums can relate to issues in other regions without assuming that environmental problems only happen somewhere else. In other words, education can encourage local action.



5.9 Communicating the message

Zoo and aquarium visitors represent a wide cross-section of society, so a variety of communication methods should be used.

The experience of zoos, aquariums, botanic gardens, exhibitions and museums in the first part of the 21st century indicates that priority should be placed upon live interpreters, as they can be the most effective means of communication. Such interpreters may be staff (who may have other roles within the organization, be it keeper, gardener or education officer) or they may be volunteers, but all should be trained in public presentation skills.

There is a wide range of communication techniques available to zoos and aquariums and these have varying resource implications.

However, all zoos and aquariums should try to use a diversity of techniques in ways appropriate to their location, size and budget. The use of the Internet is expanding rapidly, and provides a huge opportunity for zoos and aquariums to disseminate their message globally, even to non-visitors. The Internet also provides a means of exchanging ideas and information. The international network of zoos and aquariums, working together online, makes it possible to share techniques and resources relatively cheaply and even to use Internet technology for specific educational activities such as training. Whenever possible, zoos and aquariums should also communicate their messages through the media, including newspapers, radio and television. (See also Chapter 6.)

5.10 *In situ* conservation education

Education is a critical part of building support and understanding of field conservation projects among local communities in range countries. Indeed, *in situ* projects are doomed to failure in the long term if the local people are not involved and if the underlying causes of habitat loss and the threats to species are not addressed. Cultural awareness, an understanding of the language and a sympathetic ear are also essential.

Zoo and aquarium educators, with their particular skills, may have a part to play, especially in those projects that are supported by their own associations and/or institutions. A zoo or aquarium involved in a field project has a good opportunity to

use relevant educational activities to encourage public understanding and appropriate action to support the specific project. For example, projects can encourage organizations to examine issues of global trade, can enable people to buy products that support specific environmental objectives, or can encourage people to save resources or plant a tree.

Zoos and aquariums can also form partnerships with other conservation organizations, and can use the network of the IZE, to form a unified global programme to raise awareness and encourage conservation action.

5.11 Training: focused skills-based education

Zoos and aquariums are well placed to offer support through training for their staff and others engaged in specialist and community based conservation action.

Staff training

Zoo and aquarium staff must be trained and qualified for their roles; every employee and volunteer should be given an introductory overview of the aims and objectives of the organization, including its conservation and education activities. No matter what their job, the staff should be aware that they are working towards a common goal.

All zoos should develop a structured training plan for their staff and volunteers to ensure best practice in all fields of operation and support for the professional development of their staff.

While some roles may require specific qualifications, the practical work is something for which 'on-the-job' training is most appropriate, and clear objectives and processes should be identified. Zoos and aquariums should be encouraged to develop additional training programmes for some posts, particularly those

where technical skills are critical and where additional training is necessary for advancement. This may be achieved in partnership with other organizations, e.g. colleges. Some organizations develop training programmes that can also be used by people other than their staff.

Zoo and aquarium programmes should focus on more than biology, science and education, teaching their staff how the organization works, how to build teams and how to be a leader.

Zoos and aquariums may also form partnerships with local or international course providers who can then use the specialist skills and knowledge of zoo and aquarium staff.

Staff should be encouraged and supported in attending workshops, conferences and seminars given internally or externally.



Training partnerships

Zoos and aquariums are excellent learning places for the study of a wide range of disciplines, from animal care to horticulture, from information technology to exhibit design, and from leisure management to catering. In some countries (e.g. Switzerland) staff training is regulated by law, and it may be required that animals are cared for by keepers who hold a certificate. Where this situation applies, zoos and aquariums should cooperate closely with the authorities setting the legal requirements and those implementing them.

For formal education there are benefits in developing partnerships with other training and education providers, such as colleges and universities, and professional organizations such as zoo veterinarians (e.g. European Association of Zoo and Wildlife Veterinarians). Zoos and aquariums can also offer students work placements and internships, teaching and observing the work on site. Such partnerships may be used in developing staff training programmes and gaining certification and qualifications. They may also provide opportunities for funding towards training costs. Similarly, there are benefits in developing partnerships with a variety of non-governmental organizations specializing in conservation and volunteering training, e.g. Earthwatch, Landcare Australia.

5.12 Evaluation

It is essential that zoos and aquariums use a variety of methods to evaluate the impact of their education and training programmes. This will influence their planning for the future and help them to collect evidence illustrating their effectiveness as centres of good conservation education and as agents of change in affecting human behaviour and values for the benefit of wildlife and society.

Evaluation techniques can include comparative assessments of the educational effectiveness of different exhibits, surveys and questionnaires, observations of visitor behaviour, conversations, and satisfaction, records of sales of products in the zoo that have been associated with particular messages or campaigns, records of donations received, responses to pledges and petitions, records of media coverage, and teacher feedback on formal programmes.

5.13 Conclusions

The education role of zoos and aquariums is critical in achieving the goals of the WZACS. The aim of conservation education is to interpret living collections to attract, inspire and enable people to act positively for conservation. Educators need to develop linkages with a wide variety of institutions, establish

Sharing skills with colleagues

One of the greatest training opportunities that should be offered by all zoological collections is that of sharing skills and experience with colleagues in other zoos and aquariums, and with people, such as national parks officers and local wildlife officers, involved in similar activities.

Training can be both formal and informal. For example, staff from one site may visit another and discuss the way they do things (informal) or one zoo may decide to run a training workshop or conference and invite others to attend (formal). The latter is likely to reach more people, but is resource dependent and may be costly if people have to travel to attend it. Less costly options include use of the Internet and video-conferencing technology, and publications.

Additionally, relatively resource-rich organizations should consider sponsoring participants from other organizations to attend conferences, or to visit their facility for training. It must be recognized that this should be a two-way process, and those organizations that are resource-rich may learn a lot from those which are not.

Evaluation should be ongoing; methods and results should be shared first with the institution and then with the whole zoo and aquarium community through publications, and presentations at conferences, such as the IZE congresses and regional network meetings.

Evaluation is also essential for developing new exhibits, testing resources in development, monitoring interpretation, and undertaking long-term strategic planning. Evaluation may be conducted by education staff, researchers and marketing staff; however, outside opinion is also most valuable. Zoos and aquariums should take advantage of evaluation activities to make links with those local universities whose students who want to conduct social research projects. It is also useful to link up with other visitor attractions and exchange views on each other's methods.

networks, and improve and evaluate methods and results. They can thus build support for a more sustainable way of living, through both informal and formal education, and both within and outside their own organization.



Recommendations

The **World Zoo and Aquarium Conservation Strategy (WZACS)** urges all zoos and aquariums to ensure that education is a central part of their reason for being and to provide adequate support and resources to enable this role to be fulfilled.

The **WZACS** recommends that all zoos and aquarium associations, regional and national, develop an education policy. This should provide a coordinated approach to education, both formal and informal, and provide leadership in the formulation of principles, strategies and minimum education standards.

The **WZACS** recommends that individual zoos and aquariums develop or adapt their own education policies in line with those of their association and their own needs.

The **WZACS** recommends that education policy statements, strategies and standards be readily available and be reviewed and updated regularly.

The **WZACS** recommends that zoos and aquariums enhance the effectiveness of conservation education by working closely with other education institutions and organizations, governmental departments and ministries, and by being involved in formal education curriculum activities, and formal educational programmes designed for all ages and abilities.

The **WZACS** recommends that zoos and aquariums endeavour to develop structured training programmes available to all staff and volunteers.

The **WZACS** strongly encourages all zoos and aquariums to use objective and tested methods of evaluating the effectiveness of their conservation education and training programmes.

The Mesoamerican and Caribbean Conservation Action Partnership (AZA/MACCAP) and the Asociación de Mesoamérica y del Caribe de Zoológicos y Acuarios (AMACZOOA) embarked on a collaborative workshop series for zoo staff that has combined two approaches: one focuses on areas of professional development and zoo operation, while the other considers larger issues in conservation.

WAZA supports the collaborative training efforts of its constituency by the CIRCC Training Grant Scheme established in 1996. Every year three to four inter-regional training programmes or events receive financial support.

Photo: Workshop participants from the Dominican Republic receiving computer training. Cheryl Asa, St. Louis



Chapter 6

Communication: Marketing and Public Relations



Summary

This chapter presents a vision of zoos and aquariums being among the major voices of conservation through their effectiveness in communicating conservation issues, and their integrity and expertise. It lays out a set of principles through which zoos and aquariums can best communicate their conservation achievements. These principles include: zoos and aquariums are universal, inspirational, and educational and they care for their animals. They are conservation bodies which help effect change; they bring benefits to urban populations, are accountable and ethical and the support of members and visitors helps conservation in the wild. But, in addition to conservation, education, welfare and research, zoos and aquariums are about fun, and conservation and fun are not mutually exclusive. To raise the profile of zoos and aquariums as conservation organizations, every institution needs a communications strategy. This strategy should be designed to include identification of the audience, and the integration of communication through collaboration between marketing staff and animal, education and research staff, as well as other wildlife organizations. This integration should extend to such activities as collection planning, ethical review processes, enclosure design, events and interpretation. Communication messages should be factual, positive, pro-active and optimistic. The strategy should include networking and information sharing with other organizations (for marketing and benchmarking) and increasing, through training, the professionalism of staff communication skills. Zoos and aquariums should use the full range of communication media available and recognize that all staff and volunteers need to be well informed, so they can act as message bearers in their families and communities. It is also advocated that zoos and aquariums involve anti-zoo people/groups in debate and be open and transparent in all their activities. The communications strategy should be monitored, evaluated and shared. A strong, integrated communications strategy has a major role in developing zoos and aquariums as positive voices for conservation.

Vision

Zoos and aquariums and their national and regional associations will become highly effective in communicating conservation issues and their role in conservation. They will become better recognized as one of the major and most trusted voices speaking on behalf of wildlife and wild places.

6.1 Introduction

In a world of rapidly diminishing habitats, disappearing species and increasing urbanization, zoos and aquariums are uniquely placed to connect people to their natural environment, to inspire them to care, and to encourage them to play an active part in reducing the relentless rate of environmental destruction.

Zoos and aquariums have been working successfully for the conservation of threatened animal species for at least 70 years, but this needs to be communicated more effectively with an emphasis on how little of the wild is left and how seriously wildlife is threatened. Some people still have reservations about keeping animals in zoos and aquariums, and are confused by the relationship between visitor attraction and animal conservation.

This confusion is compounded by anti-zoo groups and some animal welfare groups forcing the zoo and aquarium community to react to criticism and to explain or defend particular issues such as animal welfare or ethics. When zoos are on the defensive, valuable resources of time and energy are diverted from communicating conservation and explaining the core achievements of the zoo community. The general success of zoos and aquariums as conservation organizations that strive to meet the highest standards of animal welfare is a story still largely untold and not sufficiently celebrated.



What zoos can do

Zoos and aquariums are uniquely able to carry out an enormous range of collective conservation activities. This is because they:

- keep and care for living animals, often undertaking important *ex situ* conservation functions;
- involve and stimulate vast numbers of people (around 10% of the world's population), many of whom are disconnected from nature in their daily lives;
- have invested themselves in unprecedented global partnerships;
- reach out from their home communities to wild places around the world, and carry out valuable *in situ* conservation;
- carry out research for the benefit of *ex situ* and *in situ* animal welfare and conservation;
- educate people about conservation and biodiversity, reaching millions of people around the world, from all cultures and walks of life;
- raise the debate about wildlife management and conservation, and influence politicians, the media and others;
- foster conservation experience and expertise.

Supported by effective communication, the zoo and aquarium community can make a vital contribution to the preservation of biodiversity on this planet.

6.2 Current perceptions

Over the past 10 years, since the publication of the World Zoo Conservation Strategy, there has been a slow but steady increase in awareness about the role of zoos and aquariums in meaningful conservation. However, even amongst zoo and aquarium visitors, concerns about welfare still remain, and a sense of 'mixed feelings' about the positive role that zoos may have in conservation. Several of the problematical perceptions are listed below.

- Anecdotal evidence suggests that there are fewer welfare concerns about animals in safari parks compared to animals in traditional zoos, and people are generally less concerned about fish kept in aquariums than they are about mammals and birds kept in zoos.
- All available research shows that the majority of zoo and aquarium visitors are still motivated by the quest for 'a good day out'. This can lead to a confusion in the public's attitude to the role of zoos and aquariums – if they are about fun, how can they also be about something as worthy as conservation?
- The word 'zoo' has different meanings in different cultures; sometimes the word itself can be a problem – evoking ideas of animals kept in old-fashioned menageries, one of each sort like in stamp collections.
- A general misconception which needs to be addressed is that zoos are privately owned and very wealthy. The ownership and governance of zoos varies throughout the world: some zoos are run by charitable trusts or not-for-profit organizations, some are private enterprises and others are operated by national, state or local governments.
- There is a widespread lack of awareness of the national, regional and international networks between zoological organizations, as well as networks with conservation agencies.
- There are few developed measures and published reports on zoo performance against conservation action. One of the complicating factors is the time required to effect change.
- There is little public awareness of the stringent professional standards which zoos and aquariums have to meet when successfully accredited by regional zoo and aquarium associations.

The challenge is to help visitors understand the connection between their visit and the work of zoos and aquariums in achieving conservation, and to reassure them about the increasingly high levels of welfare for zoo animals.

6.3 New goals

In terms of communication, zoos and aquariums will be:

- effective in inspiring audiences, communicating the conservation message to them, and practising effective evaluation;
- recognized as an expert voice on conservation issues, and as a vibrant and enduring community of institutions that reconnect people with nature;
- trusted as a reliable and accurate information source, as socially and culturally relevant institutions, and as practising what they preach.

They will also welcome constructive criticism and will work to address any such legitimate concerns.

Zoos and aquariums will communicate their achievements by focusing on the following messages.

Zoos and aquariums are universal

Zoos and aquariums are uniquely placed to be an effective force for positive action in a rapidly changing world. Over the next



10 years, they should communicate this message so that they no longer need to apologize for holding animals in managed environments. Rather, their value will be widely understood and they will be appreciated for their contribution to the conservation of biodiversity.

Zoos and aquariums should focus on the uniqueness of what they have to offer – living animals, and staff experienced and committed to their care and long-term survival as species in the wild. Collections should encourage visitors to experience and enjoy the sense of surprise and wonder engendered by proximity to real, living animals in naturalistic habitats.

Zoos and aquariums are conservation centres

Zoos and aquariums should encourage visitors to understand the links between the animals they see and the animals in the wild, and how visitors are helpful to both. They should also promote the *in situ* conservation successes of other zoos and aquariums and of other conservation organizations.

Zoos and aquariums help to effect change

Effective communication affects not just what people think about zoos and aquariums, but what they think about the world around them and their part in helping to preserve its biodiversity and habitats. Information about re-using and recycling should all be part of the institution's message on environmental sustainability.

People will be able to 'make a difference' as a result of their visit and zoos and aquariums must give visitors practical ideas and suggestions as to what personal action they can take, however small. Each institution should demonstrate the relevance of conservation to people's lives, and make it easy for people to take action.

Probably the most effective way that zoos and aquariums can encourage change is by example. They should strive to become environmentally sustainable in all their activities: by using appropriate building materials, waste management, catering supplies, fair trade and ethical policies for fundraising, sponsorship and investments. Zoos and aquariums can celebrate these activities with pride.

By communicating what it is doing for conservation, the zoo community will not only increase the understanding and appreciation of its role in the conservation of biodiversity but also encourage visitors to take positive actions to make a difference to life on this planet. People will thereby feel less guilty and powerless about the state of the planet and more willing and able to make a personal contribution.

Zoos and aquariums are inspirational

Zoos and aquariums will inspire people to help conserve biodiversity. There is a demonstrable thread which runs from con-

servation through education, education through inspiration, and inspiration through fun.

Zoos and aquariums are accountable

Zoos and aquariums should be honest and open about all their activities and should welcome close scrutiny of all their welfare, breeding, research and education programmes. In years to come, the word 'zoo' should no longer have any kind of pejorative or questionable connotation; it should have become as acceptable as the word 'aquarium' has become in recent years.

Zoos and aquariums care for their animals

Zoos and aquariums must communicate the continuous improvements they make in animal welfare and enclosure design, bringing benefits for both animals and visitors – spacious, natural habitats which enrich the lives of animals and make for a more interesting experience for visitors.

Animal welfare is constantly improving, as the knowledge of animals' needs – physical, environmental, social, psychological – increases with research and observation. Animals in well-run zoos and aquariums have a very high quality of life – with good diets, veterinary care, appropriate habitats and an absence of predators. Zoos and aquariums also commission and welcome new research on managing their animals, both physically and psychologically.

Increasingly, there is stringent and sensible legislation for the protection of animals and people in zoos and similar institutions. Good zoos and aquariums welcome, and participate in shaping, improved legislation; they must be prepared to state that those zoos that fail to comply, either in actuality or in spirit, are unacceptable. Apart from the potential to compromise animal welfare, poor zoos do serious damage to the reputation and image of good zoos everywhere. The zoo and aquarium community needs to do all it can to help improve those institutions which are poorly maintained, but good zoos and aquariums should be careful to distance themselves from those that fail, and strongly publicize their exclusion or dismissal from regional or national membership bodies if they do not meet minimum standards for welfare, conservation and education.

Zoos and aquariums bring benefits to urban populations

Urban children today are the conservationists and opinion-formers of tomorrow. Zoos and aquariums are places of relative peace and tranquillity, sometimes even spirituality; they should stress the value of allowing people to get back in touch with nature, and feel good about themselves and their place in the natural scheme of things. Zoos and aquariums are places where people gather together as families and social groups, and learn and develop shared values about wildlife and the natural world.



Zoos and aquariums have an ethical approach

The ethics of managing animals are necessarily complex; the zoo community needs to strive for a shared and universal approach to explaining difficult ethical issues arising from managing animals for conservation, including culling for management purposes.

Zoos and aquariums are educational

Education has long been recognized as a major success of zoos and aquariums, but zoos need to explain more about what this actually means, how they can be places of life-long discovery and learning, how topics can be offered relevant to a broad range of school curricula, and how education can often lead to change.

6.4 Fun and conservation are not mutually exclusive

There should be no problem in promoting zoos and aquariums as being about fun as well as about conservation, education, welfare and research. A zoo visit is supposed to be fun; it should remind people of the wonder of life and the joy of the natural world. Not even the most carefully crafted wildlife documentary can replace the vivid experience of seeing real animals, properly cared for, living in stimulating and naturalistic habitats, or hearing first hand the personal stories of animal keeping staff. Carefully thought out communication strategies can help visitors to learn while they are having fun.

- Interactive experiences can be achieved through the interactions of zoo staff with animals when keepers or presenters demonstrate and explain natural behaviours. Such interactions should place no unnecessary stress on the animals involved.
- Visitors should be encouraged to understand that the fun that they are experiencing during their visit today has a direct link to the conservation of threatened species tomorrow.

6.5 Getting the message across

Design a strategy

A practical first step that any zoo or aquarium can undertake is to design a communications strategy.

Identifying the audience

Visitors are the key target audience, but the zoo community should also communicate its conservation success story to politicians, the media, academics, educationalists and other influential people. Zoos and aquariums should communicate more effectively with each other and with all staff and volunteers within their own organization.

Zoo and aquarium membership helps conservation in the wild

People can be encouraged to support zoos and aquariums for altruistic rather than economic reasons if they are told how their money helps directly with conservation in the wild, how it helps to improve welfare in the zoo or aquarium, and how the zoo is working with other conservation bodies with events, promotions, exhibitions etc. Zoos and aquariums should never miss opportunities to thank people for the support that their day visit, subscription or sponsorship is giving to conservation and biodiversity.

- Visitors should be provided with every opportunity to talk to staff, to be treated as guests on a shared journey of discovery and appreciation for the future of the natural world.
- When zoos and aquariums are fully integrated with other conservation organizations and agencies, visitors will feel good about their visit, knowing that it is contributing positively to the conservation of threatened species and habitats.
- People will be motivated by altruism when they become members and sponsors of zoos and aquariums – they will join to help further their conservation goals, not just because membership offers a ‘season ticket’ to visit the attraction or other benefits.

The overarching aim of communications in this context is for zoos and aquariums to be recognized and respected as conservation organizations. This conservation role will be fully compatible with the fun that zoos and aquariums offer to visitors: fun and conservation are not mutually exclusive.

Integrated communication

An integrated approach to communication is required to communicate effectively the conservation work of zoos and aquariums in and out of the wild. For example, zoos and aquariums should establish links between marketing staff, scientists, animal staff and education staff to ensure shared knowledge within each organization. They should also establish links with local staff and wildlife organizations working in the field, and should establish links with institutions in the countries where *in situ* work is taking place.



Marketing and education people within zoos and aquariums must work closely together to ensure that they are communicating the same messages, albeit in different ways and possibly to different audiences.

Integrated zoo activities

Marketing should be fully integrated into other zoo activities: animal collection planning, ethical review processes, enclosure design, events and interpretation. The polarity which sometimes can be found between marketing and animal staff must be broken: everyone is working towards the same goal, and activities will be more effective if people work together.

Positive communication

Zoos and aquariums should ensure that communication does not sound like justification. There is no need to take a defensive position; instead, the zoo world should take a positive, proactive approach in all its communications. In particular, the institutions should celebrate more of their achievements, and stress and explain the need for conservation and biodiversity. In doing so, they will make doubters feel more comfortable, even enthusiastic, about visiting a zoo or aquarium.

Zoos and aquariums must be much clearer, more concise and more consistent in the messages that they promote. To do this, they must work harder to agree what the messages are. Messages should be positive and optimistic. The progress of destruction of our planet's natural resources, habitats and wildlife can be alarming and seemingly insurmountable, so zoos and aquariums should take every opportunity to let people know about the conservation success stories, and how they can participate. The decline of biodiversity cannot be allowed to continue, and the institutions must remind people that they are a positive force for good in the battle against this decline.

Zoo and aquarium communicators must be clear about what is meant by conservation. In particular, they must acknowledge that there is a difference between direct conservation – supporting fieldwork in the wild and those programmes out of the wild – and indirect conservation which works on changing attitudes and behaviours.

Working with other zoos and aquariums

Zoos and aquariums must strive harder at working together. Through networking, information exchange and benchmarking, they can share basic information which can then be communicated to a wider audience. Institutions need to share data, for both benchmarking and marketing purposes, for example the number of endangered species in managed programmes, breeding success stories, number of visitors exposed to conservation messages, number of school children and range of topics being taught, number and range of research projects being carried out, those species that have been returned to the wild successfully (being careful not to raise inappropriate expectations

here), and the number and type of *in situ* conservation projects supported by zoos and aquariums. WAZA is in the process of compiling a global data base of conservation projects that its members are involved in.

By collecting and sharing information of this nature, the messages will become more robust, zoos and aquariums will build and strengthen their networks, and the zoo community will become a more collective entity. In parallel, this form of networking should be extended to conservation agencies and non-governmental organizations.

Increasing professionalism

The zoo community needs to raise the level of its professionalism in the communications skills of its staff. Marketing people should be considered an essential part of the senior management team of any zoo or aquarium, and their skills should be developed through training, travel and networking.

Zoos and aquariums should have strategies in place, supported by appropriate technologies, so that they can communicate messages quickly and effectively with each other and with the media, relevant NGOs and others. It is essential that, in an emergency, zoos work to an agreed crisis plan that is appropriate and relevant to their own organization and to their regional membership organizations.

Methods for communication

Zoos and aquariums should take every opportunity to explain what they are actually achieving for conservation by whatever means. The Internet is one tool for doing this. On a more informal but no less important level, all staff must be well informed, not just those that are in the forefront of talking to visitors, so that when they talk to friends and family, they can explain what their organization is doing for conservation.

Communicating conservation can be done in a variety of ways, ranging from formal talks and tours, interpretative signs and guide books, through to leaflets, posters, calendars, media stories, family events and workshops, art and photographic exhibitions and even paper bags in gift shops. There is almost no limit to the variety of media which can be used to support and communicate even quite complicated conservation issues, at the same time reinforcing the message about the conservation work of zoos and aquariums.

What language?

Zoos and aquariums should use, wherever possible, simple and direct language, avoiding the use of jargon or unexplained technical terms.



Anti-zoo groups

Zoos and aquariums should face detractors with honesty and sound science. They should genuinely listen to their critics, share their concerns, and invite them in to see what zoos and aquariums are doing in the 21st century. Wherever possible, they should involve anti-zoo people or groups in the debate. If zoos understand the issues raised by such people, they can agree on a consistent message and strategy within local, regional or national networks so that they can take control of the debate and move it to another level – about the long-term value of zoo

conservation. The zoo community must be pro-active in celebrating all that is good about zoos and aquariums.

Zoos and aquariums must be open and transparent in all their activities, in public and behind the scenes. A zoo that is comfortable with visitors seeing how it cares for its animals is likely to have it right.

Zoos and aquariums should accept that they will never persuade everyone, but they can go a long way towards enlightening and convincing people with doubts.

6.6 Evaluating success

A variety of indicators can be used to evaluate the success of an agreed communications strategy.

- In the short-term, zoos and aquariums will need to test that their messages are clear and understood.
- In the longer term, they should see an increase in the public's awareness of conservation issues in general, of the conservation role of zoos and aquariums in particular, and of the World Association of Zoos and Aquariums (WAZA) and its mission ('United For Conservation').

- Support for zoos and aquariums can be measured by increased visitor numbers and by increased zoo membership numbers and increased sponsorship schemes, especially those prompted by support for conservation.
- General media success can be measured by a continuing increase in positive zoo/conservation news stories or features.
- There should be an increase in partnerships with other conservation bodies.

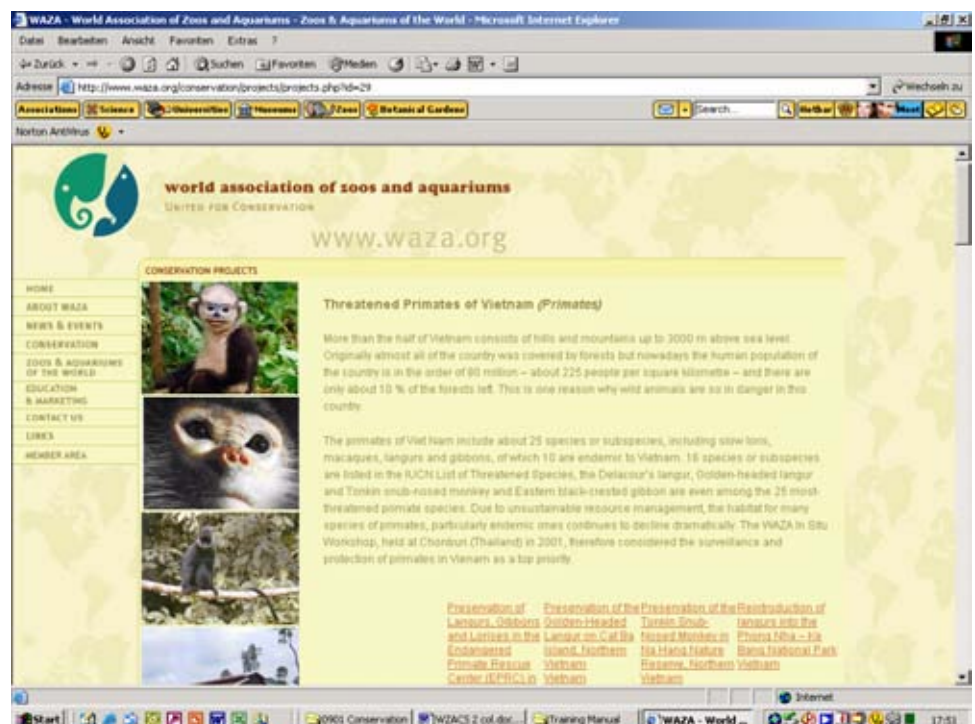
Recommendation

The World Zoo and Aquarium Conservation Strategy (WZACS) strongly recommends that all zoo and aquarium associations, and all zoos and aquariums, however small or large, design and implement a communications strategy. This should include the following basic steps: define the overall communication goals; identify the target audiences; decide key messages; choose tactics and methods; identify resources available and needed; and develop monitoring and evaluation techniques.

The Internet has become an important means of communication for the zoo and aquarium world. WAZA, and the vast majority of WAZA member associations and institutions, have their own websites, which are increasingly used for communicating conservation issues.

Picture:

WAZA-branded conservation projects, here the Na Hang, Cuc Phuong and Cat Ba projects of Münster Zoo (WAZA Project Nr. 04007, 04008 and 04009), and the Phong Na - Khe Bang Project of Cologne Zoo (WAZA Project Nr. 04015), are presented on www.waza.org



Chapter 7

Partnerships and Politics



Summary

This chapter presents a vision of increased global cooperation between zoos and aquariums and other organizations to achieve conservation goals. Zoos and aquariums represent a unique mix of technical and interpretative expertise, legal and environmental ethics and biological diversity. However, no zoo or aquarium is an island - it cannot alone carry out everything needed for biodiversity conservation. Thus these institutions need partnerships - with each other and with other institutions such as parks, protected areas, government departments, wildlife and environmental agencies, animal welfare organizations, conservation organizations, and academic, professional, cultural, commercial and community organizations. Zoos and aquariums should become members of national and regional associations and support their well-intentioned but under-resourced colleagues. They should however also support governments in reforming or closing those that fail to achieve acceptable standards. Zoos and aquariums can be mutually supportive by exchanging training, programmes and material and by involving local zoos in conservation projects and outreach programmes. The World Association of Zoos and Aquariums (WAZA) is formalizing links with several organizations, including IUCN - The World Conservation Union. WAZA members frequently work with IUCN Specialist Groups, both taxonomic and discipline-based. Partnerships with academia bring increased research opportunities, and partnerships with schools can provide the chance to influence curricula. Linking with libraries and art galleries promotes creative visual and written natural history. Conservation affects people whatever their occupation or social class, so common interest can be developed with architects, engineers and town planners. Partnerships with the media reinforce the conservation message. WAZA requires that all institutions should work within conservation legislation and abide by the WAZA Code of Ethics. Operating ethically and providing information enables zoos and aquariums to influence public opinion and voting habits. By developing strong collaborative relationships with a broad spectrum of partners, zoos and aquariums can substantially increase their conservation impact.

Vision

Through increased cooperation and judicious encouragement, zoos and aquariums will continue to raise standards of animal management, educate the public to act on behalf of conservation issues, and assist in field projects. Partnerships will strengthen global cooperation and help all zoos, aquariums and other conservation organizations to improve and to achieve their conservation goals. Zoos and aquariums will be encouraged to help one another, particularly those that have fewer resources and/or expertise.

7.1 Introduction

Zoos and aquariums represent a unique mix of technical and interpretative expertise, legal and environmental ethics, and biological diversity. There is a growing trend for them to cooperate with each other and with other government and non-government organizations. For example, zoos and aquariums may take part in cooperative breeding programmes, education programmes, research projects or field projects to help to prevent or minimize wildlife extinctions, preserve biodiversity, and create a conservation consciousness in individuals, institutions and societies.

In the coming years, zoos and aquariums that are truly effective will improve and expand upon these activities, as well as helping less successful zoos to use their individual potential constructively. Partnerships will strengthen global cooperation and help zoos and other conservation organizations to achieve their conservation goals. Even a small zoo can make an important contribution to conservation, and in collaboration, zoos and aquariums can form a highly effective global network through which they can reach a vast number of individuals, organized groups, business communities and political institutions.



Working with sensitivity and patience, paying respect to the diverse political, historical, social and economic characteristics represented in each culture, each zoo and aquarium will make

7.2 No zoo is an island

Without intervention small populations reach a point of no return and this fact has been used to justify the existence of zoos and aquariums and breeding through the cooperative management of species. But the role of zoos and aquariums in species conservation is far greater than providing a savings bank of animals. Today, these institutions invest resources to save large tracts of habitat, sponsor corridors where fragmented populations of large mammals can interact, and educate the public to become involved in habitat conservation.

Zoos and aquariums need other zoos and aquariums in order to be relevant and effective in their contribution to conservation: they cannot independently carry out all tasks related to the conservation of biodiversity. They are most effective when they have the assistance of other organizations, both governmental and non-governmental.

A potentially vast and impressive network will become ever more achievable if all zoos develop sincere and creative means to communicate and collaborate with others. The first priority must be international cooperation between the zoos themselves. This is most easily achieved through regional and national zoo associations that represent individual zoos and aquariums, and through the World Association of Zoos and Aquariums (WAZA), the global zoo organization.

Types of partnership

The collective zoo network comprises zoological parks and gardens, safari parks and aquariums that have learned from one another. Many individual zoos and aquariums have reached a high level of development through sharing their increasing expertise. Partnerships for zoos and aquariums are not merely useful and desirable; they are essential. In particular, zoos and aquariums should consider forming partnerships with:

- other zoos and aquariums (local, regional and international);
- national and regional zoo and aquarium associations;
- the global zoo and aquarium association (WAZA);
- friends of the zoo associations;
- parks and protected areas;
- governmental departments, ministries, and wildlife agencies (e.g. forestry, environment, education, agriculture, animal husbandry or veterinary, tourism);
- community organizations (civic organizations, schools, libraries);
- environmental agencies;
- other governmental and non-governmental conservation and animal welfare organizations;
- related academic, professional, cultural, commercial and

the most appropriate contribution to conservation in the context of its own culture and economy.

community organizations (e.g. research institutions, colleges, universities, training institutes, museums, zoological associations, botanic gardens).

Box 7.1 shows examples of effective partnerships between zoos and aquariums and other agencies.

Cooperative breeding programmes

One well-established example of shared experience and expertise between zoos is cooperative long-term breeding programmes. These can provide the genetic diversity needed to sustain a declining population, restore a population extinct in the wild or, at the very least, preserve genetic material for the future.

The first example of a cooperative breeding programme occurred in 1900, when several zoos sent their stock of Père David's deer, *Elaphurus davidianus*, to Woburn Abbey. In 1923, the director of Frankfurt Zoo established the International Society for the Conservation of the European bison (Wisent) *Bison bonasus*. The zoos of Berlin, Frankfurt, Halle, Hamburg-Hagenbeck and others contributed animals, and Warsaw Zoo accepted responsibility for the studbook in 1932. The society drew inspiration from the Society for the Conservation of the American bison, which was disbanded in the late 1930s due to its success in saving this species. In subsequent years, the use of studbooks and cooperative breeding programmes has continued to grow enormously. (See also Chapter 4.)

The 1990s saw zoos and aquariums become involved in a number of wide-ranging species conservation programmes. Many (particularly in temperate countries) began to help with field projects in areas chosen for their high biodiversity. Some projects aimed to reintroduce zoo-born animals to the wild habitats from which they had disappeared. Others were designed to protect habitats, strengthen corridors and foster conservation awareness among people living in the natural range of target species. Species conservation programmes also included the formation of systematic and scientific programmes, such as the Species Survival Plans (SSPs of AZA), the European Endangered Species Programmes (EEPs of EAZA), the Australasian Species Management Programmes (ASMPs of ARAZPA), and the African Preservation Programmes (APPs of PAAZAB). These programmes have become the essential basis for cooperative *ex situ* population management for selected species.



Box 7.1

Examples of Partnerships

Asia

The Taipei Zoo, the TOAF Foundation, the Han-Shan Primary School and the Council of Agriculture and Taipei Zoological Foundation collaborated on a wetlands project to save the Taipei grass frog *Rana taipehensis*, which was declining due to use of pesticides and loss of habitats. The zoo encouraged local farmers to grow organically and sell waterlilies *Pomacea canaliculata*. Help was also given to protect the lilies from the Tobacco killer cutworm moth *Spodoptera litura* by spraying natural plant extracts and cutting the grasses which harbour the moths. A teacher training programme on wetland issues was organized for the local community. Through community and national partnerships, people can make enlightened environmental decisions based on the 'Five E-Values': economical benefits, environmental services, ethical concerns, 'esthetics' and educational benefits.

North America

Brookfield Zoo is one of 130 institutions, conservation organizations and municipalities partnering with 19 federal, state and county agencies and owners of natural lands in 'Chicago Wilderness'. 'Chicago Wilderness' is a group of organizations which make up the Greater Chicago Biosphere Project, a 15-year-old initiative which has produced many useful research and information products for individual, corporation and community use and which may result in the first urban biosphere reserve. Zoos, aquariums, museums and nature centres help to provide extensive communications and outreach efforts to the Chicago metropolitan public. The city provides several thousand volunteer field workers who assist in environmental conservation and restoration, linked by a switchboard network hosted by Brookfield Zoo.

Europe

The Copenhagen Zoo 'adopted' a group of Golden lion tamarins *Leontopithecus rosalia* in the Poco das Antas Reserve in Brazil by paying the salary of a field biologist collecting data for the long-term conservation of these animals. The biologist contributes authentic stories from the field that the zoo can use in interpreting its Golden lion tamarin exhibit effectively. In this way, Copenhagen Zoo and other funding zoos bring 'home' conservation activities 10,000 km from Europe. The Golden lion tamarin project gets funding to continue the all-important conservation research. A genuine win-win situation has been extended to 'adopt a corridor', and other components of the reserve. Projects such as this provide opportunities for zoos to support field conservation, for conservation projects to attract global attention and funding and for promoting an understanding of living conservation at work.

In June 2003, Zurich Zoo inaugurated its new Masoala Hall, a rainforest exhibit simulating conditions found in Madagascar's Masoala National Park. Within the confines of the 10,000 square metre exhibit, with humidity levels of over 80% and temperatures in the mid 30s C, are a wide range of plants and animals. Many of the over 17,000 plants have come from seeds collected in the forests outside the National Park and grown in nurseries set up by Park managers with support from Zurich Zoo. The building has its own rainfall with sprinklers sending down up to 80,000 litres of water a day, and there are few barriers between visitors and wildlife as they wander through this faithfully reproduced Malagasy rainforest. There are many links between the exhibit in Switzerland and the National Park in Madagascar. Already Zurich Zoo is bringing long-term financial contributions to a number of projects in communities around the park that will improve access to drinking water, health care, education and markets for local produce. Revenues generated by the new exhibit are channelled through the National Parks Service (ANGAP) in Madagascar, and the Wildlife Conservation Society (WCS) in New York, to help cover the management costs of the National Park and continuing development initiatives in surrounding villages. Visitors to the exhibit are also encouraged to travel to Madagascar and thereby increase much-needed tourist earnings. The benefits of this type of partnership between a European Zoo, a National Park in a developing country, and an international conservation society, are numerous and far-reaching.

Africa

The African Association of Zoos and Aquaria (PAAZAB) and the South African Crane Working Group (SACWG) are cooperating to help Wattled cranes *Grus (Bucconator) carunculatus*. SACWG is part of the Endangered Wildlife Trust, a local non-government organization. It has developed a recovery programme for the regional population of Wattled cranes. The programme requires the establishment of a secure regional captive population of Wattled cranes for reintroduction. PAAZAB members participate by breeding cranes supplied to them by SACWG.

Australasia

In Papua New Guinea, members of the Australasian regional zoo association (ARAZPA) have come together with local communities, the PNG Office of Conservation and Environment and non-government organizations such as the Nature Conservancy to form the Tenkile Conservation Alliance. The aim of the project is to conserve the Tenkile, *Dendrolagus scottae*, a recently described tree kangaroo species. In 1998, researchers estimated that as few as 100 Tenkile may remain, and the species was still threatened by hunting for ceremonial purposes. Under the Tenkile Conservation Alliance, representatives from the PNG government and Australian and PNG zoos negotiated a moratorium on hunting with local communities. The Tenkile Conservation Alliance is currently running a Tenkile research and conservation field project (WAZA Project Nr. 04016) and developing community outreach and information programmes.



Field projects

Zoos and aquariums that undertake field projects will usually need to form partnerships with other organizations, whether the projects are situated in a distant country or locally. When zoos and aquariums conduct field projects in the future, they need to coordinate their activities with those of national and regional zoo associations, and local conservation organizations.

7.3 Not all zoos are equal

Not all animal collections calling themselves zoos or aquariums meet the standards necessary for effective conservation work in today's world; they may lack a solid financial base, or have poor standards of animal care and weak institutional ethics, or not be members of a national, regional or global zoo organization or association.

Poorly maintained animal collections are a negative reflection on all well-maintained zoos and aquariums, and they can be a drain on wildlife resources and a cause for welfare concern. Such facilities may seem an impediment. Nonetheless, some of them may have good intentions and may even be close to being creditable. These zoos can be seen as an opportunity for institutions with high standards to assist in solving this serious problem.

A challenge for all well-resourced zoos and aquariums will be to develop partnerships with well-intentioned but under-resourced institutions. Appropriate mentoring, and technical, logistic and perhaps financial support, will help these facilities to achieve their potential within the world conservation community. At the same time, and importantly, the global zoo network should work assiduously towards strengthening the hand of governments as they attempt to reform or close zoos and aquariums which are unable to achieve desired standards of animal management and welfare.

In the last decade, many zoos and aquariums have conducted outreach programmes that centre on field projects in other parts of the world. Such projects include the establishment of breeding centres, the purchase and management of wild lands, habitat improvement, translocation and reintroduction programmes and community education and development. They often require substantial resources, both financial and in kind through staff time, technology transfer and training. Zoos and aquariums in developed regions are financially and technically often in a position to lead improvement in the standard of zoos worldwide.

Field conservation projects provide a good opportunity to forge zoo-to-zoo and aquarium-to-aquarium links through technol-

This cooperation will allow organizations to avoid duplication of effort, territorial prerogatives, and cultural dissonance. It will also enhance the resources (which may be living organisms, funding or expertise) that may be brought to the project. Where appropriate, and with regional governmental approval, local communities should be included as potential beneficiaries of such projects. (See also Chapter 2.)

ogy transfer and training, particularly in the areas of education, basic management skills and marketing. Local zoos and aquariums can be key resources for engaging local communities in projects and encouraging people to appreciate their natural environment. Institutions conducting field projects should make every effort to include, where practicable, local zoos and aquariums in the project. Such ties will help the local institutions to promote understanding and contribute to the sustainability of local wildlife management. It is not appropriate for a well-resourced zoo or aquarium involved in a field project to ignore or snub poorly maintained or under-resourced animal institutions in the region. Well-resourced institutions should attempt to work with local institutions to improve their standards and capabilities.

Such interaction and partnerships will establish trust and cooperation between zoos and aquariums in all parts of the world. They will also expose local zoos to the standards and ethics of the international zoo community. Substandard facilities often contribute to the regional destruction of wildlife and promote dubious values among their visitors. Sensitive mentorship, interaction and partnership in these cases may be useful to regional conservation, as are field research and habitat improvement. Where possible, zoos with *in situ* projects should coordinate with national and regional associations; if such associations do not exist in the area, they should cooperate with individual zoos.

Equal partnerships, such as the exchange of training, can promote understanding and friendship on both sides. Visiting zoo personnel can be trained in the host country's culture and economics, as well as in technical subjects related to conservation. Conversely, people of ancient cultures can share their knowledge of alternative management techniques, local medicines and natural foods. The exchange of such knowledge can improve our understanding of species held in zoos and aquariums and our ability to interpret the importance of some animals in other cultures. Such an arrangement will create an atmosphere where equal and genuine partnerships are possible. (See also Chapter 5.)



7.4 Special linkages

WAZA

WAZA encourages partnerships among zoos and aquariums of all sizes, ages and degrees of complexity, as well as partnerships with related institutions, agencies, and individuals. It has recently begun to reinforce and formalize its links with governments, governmental organizations and international NGOs, especially IUCN-The World Conservation Union, Transport Associations and the United Nations Environment Programme, which administers the Convention on International Trade in Endangered Species of Wild Fauna and Flora. WAZA and its member zoos also have partnerships with like-minded professional organizations such as the International Zoo Educators Association.

Using the huge pool of scientists it represents, WAZA should focus on providing technical and scientific advice with a view to furthering species and habitat conservation, promoting sustainable development and enhancing animal welfare. It should also expand and formalize its partnerships, for example by granting affiliate member status to professional organizations that are interested in working under its umbrella and by concluding memorandums of understanding with governmental bodies and major NGOs that are not interested in affiliate membership. In forums such as conferences of parties to international agreements, WAZA should coordinate the activities of delegates from zoo associations as well as those from individual zoos and aquariums.

IUCN

IUCN with its worldwide membership, its regional and country offices, and its Commissions with their networks of scientific, technical and policy experts, provides many opportunities for linkages with the zoo and aquarium community. Particularly valuable is the Species Survival Commission (SSC), which hosts taxon-based and disciplinary Specialist Groups and task forces that hold a wealth of information and expertise on taxa of conservation interest, conservation biology, veterinary medicine, translocation of living organisms and environmental issues. Zoos and aquariums can access this information by interacting with the Specialist Groups. In turn, the zoo community can often help the Specialist Groups to make contact with relevant people and organizations in countries and regions where they have no representation.

Linkages with relevant specialist groups (SGs) are particularly helpful when a zoo is contemplating a field project. Some zoos have already helped fund Specialist Group newsletters and Specialist Group activities; for example, *Small Carnivore Conservation*, the newsletter and journal of the Mustelid, Viverrid and Procyonid SG has been supported by Antwerp Zoo, Columbus Zoo and Aquarium, Marwell Zoological Park, Central Park Zoo, NY and other zoos.

The IUCN SSC Conservation Breeding Specialist Group (CBSG) aims 'to conserve and establish populations of threatened species through conservation breeding programmes and through intensive protection and management of these plant and animal populations in the wild.' It does this through systematic, scientific and focused group processes which link *in situ* and *ex situ* conservation and the people who can provide scientific expertise, catalysis and coordinating ability. Other specialist groups, especially the Re-introduction Specialist Group, are increasingly finding useful ways to link with zoos.

Zoos and aquariums frequently provide staff expertise and funding for other IUCN groups. In particular, they contribute to the work of Population and Habitat Viability Assessment (PHVA) workshops, which assist in the development of strategic recovery plans for threatened species and their habitats, and to Conservation Assessment and Management Plan (CAMP) workshops, which assess species for inclusion on the IUCN Red List. Workshop participants make management and research recommendations on issues such as the need for networking taxon groups, field studies, field technique training, habitat improvement, health monitoring, zoo breeding for education, research or conservation, and education and awareness programmes.

Other organizations

When zoos and aquariums partner with academic organizations, they often find opportunities for cooperative research in conservation, biological, veterinary and social sciences. When zoos link with schools for nature and environmental education, the schools can help the zoos to plan educational literature and programmes around a unified curriculum of a city or a region. When education departments in municipalities and states plan their environmental programmes, they will find the educational resources of zoos a valuable adjunct to their other activities.

Partnerships with botanic gardens, national parks, and museums can help to break down the artificial institutional division between plants, animals and ecosystems that has existed since the 18th century. Partnerships can be made with institutions in the zoo's own locality or with institutions in underdeveloped countries if the zoo has the financial and technical means to provide technical material, training, equipment and other help useful to conservation. Other conservation and animal welfare agencies and organizations, particularly in less developed parts of the world, welcome financial and technical assistance from well-established zoos, which can often find experts for advisory projects from their own staff.

Twinning exhibits, particularly new exhibits, with reserves and conservation projects, can be particularly rewarding and bring benefits to all concerned.



Cooperative efforts between natural history institutions can also be usefully extended to other cultural facilities. Joint programmes with the zoo or aquarium and its local libraries could focus on nature writing, for example, and involve public readings by authors, poetry competitions, writers' workshops and a host of other creative projects centred on writing and nature. Similar partnerships could be forged with art organizations, encouraging painters and other visual artists to help carry the messages more typically promoted only by zoos.

Because conservation affects all people whatever their occupation or social class, collaborative programmes about conservation and wise stewardship of the environment need not be restricted to cultural institutions. Many professional organizations – such as those for architects, landscape architects, engi-

neers, building contractors, and others involved with planning and developing the human environment – should find areas of common interest and activities that they can promote in concert with zoos. Creative thinking by zoos and aquariums will find yet other partners creatively to bring conservation messages to wider audiences.

Within their local communities zoos and aquariums can become leaders in public debates about sound ecological practices, encouraging examination of such regional issues as suburban development, clean water, pesticide pollution and other areas of human activity that affect local wildlife. Partnerships with local media are particularly useful here. Usually zoos and aquariums foster contacts with the media primarily for their own promotion but they could also do it for the sake of conservation.

7.5 Policy and legislation

Responsibilities

Local, regional and national governments determine legislation and policy on the environment, biodiversity, animal welfare, sport hunting and fishing. In the coming decades, there will be an emphasis on the whole Earth ecosystem; zoos and aquariums will be in a position to inform, encourage and work with governments and legislators in this broad context. Zoos and aquariums must comply with all the legislation and policy that affects conservation. Responsible zoos and aquariums will monitor their sister institutions in this regard by refusing to participate in illegal or unethical transactions and by trying to reform such institutions through peer pressure. If compliance is not forthcoming, responsible zoos may take even stronger measures, such as reporting them to WAZA and relevant government authorities. The WAZA Code of Ethics requires member zoos and aquariums to abide by national and international wildlife and welfare legislation. All regional and national zoo associations should be members of WAZA, and thereby committed to the WAZA Code of Ethics, as well as being committed to their own national or regional ethical conventions. (See also Chapter 9.)

All zoos and aquariums should be members of regional or national associations. Such associations have proved themselves to be extremely effective forces for improvements in zoos, whether by policies, peer pressure or politics. All regional and national zoo associations should make every effort to represent and engender a conservation conscience appropriate to their culture within their member institutions, and to bring their members' activities into a common ethical and technical framework. National and regional associations should persuade their respective governments to improve or create zoo legislation that will provide mechanisms to help zoos carry out their conservation purpose. To be effective, government zoo policy should include legislated regulations that underpin explicit and species-specific standards and guidelines.

Zoos and aquariums should not only maintain an ethical position in support of conservation but also where possible use their unique institutional profile to influence public opinion and voting habits. Providing information on conservation issues that can be resolved or improved by local, national or international legislation or simply by local community action is one of the most powerful conservation tools that zoos and aquariums can bring together. Institutions should liaise with each other either individually or through their association to obtain accurate information in order to strengthen their efforts.

Zoos and aquariums address visitors through different means, including educational displays, lectures, and printed material. Zoos and aquariums can enlist zoological societies in these tasks by providing well-designed and effective educational materials, by organizing action and by keeping in contact with other conservation organizations in the community. Zoos and aquariums can present issues in international forums through their associations, and locally by providing representation on local councils and committees.

Influencing policy makers

Visits by politicians, policy makers and celebrities provide an opportunity for expert zoo and aquarium staff to promote issues involving wild species and wild habitat survival. The information given should be focused on these broader issues rather than on more narrow, zoo or aquarium-specific ones. Zoos and aquariums can also influence law-makers and other influential community members by taking them to off-site venues – local or overseas – that are important to wildlife. The opportunity to visit wild habitats or wildlife refuges in the company of animal curators or researchers is often very appealing to non-specialists. In these ways, zoos and aquariums can build on the universal appeal of wildlife by providing a close encounter with the animals and the knowledge of specialist zoo staff. The trust and knowledge engendered by such encounters



will lead to improved conservation legislation, locally and worldwide. The result will be to the benefit of all wildlife.

Legislation

Some countries have created basic zoo and aquarium legislation and a few have established species-specific standards and norms for animal care, conservation, education and other aspects of an institution's operation. In some cases, national or regional zoo and aquarium associations have helped the government to formulate legislation. Those countries without appropriate legisla-

tion or regulation of any kind will benefit from using that of other countries as a model when formulating their own policies and regulations.

Zoos and aquariums in countries with the appropriate regulation are well placed to encourage other institutions – both regionally and internationally – to address regulatory issues. In particular, they can help zoos and aquariums in countries where there is no relevant legislation to establish and enforce an effective system for maintaining high standards of zoo and aquarium management.

7.6 Conclusions

Zoos and aquariums enlighten, enthrall and inspire their audiences about wildlife. As with all natural history institutions, their greatest responsibility is to encourage a level of respect and an understanding of nature so deep that people will become enthusiastic about conservation. People who are compassionate, informed and enthusiastic about conservation will choose to make lifestyle changes, to make everyday decisions that support the environment, and to vote for politicians who want to set progressive conservation policies.

The physical separateness of our natural history institutions, be it zoo, aquarium, botanic garden or museum, is not an effective way to carry messages about diversity and connectedness, to demonstrate interdependency, to present holistic views of nature, or to convey dynamic stories of ecosystems. It is of course impossible to relocate such facilities, but they can demonstrate their interdependence through strategic partnerships. Through collaboration, each institution can strengthen its role as nature's

ambassador. All zoos and aquariums should link with other organizations that can help them carry out their conservation mandate. Such organizations will in turn benefit by their association with the zoo and aquarium community.

There is a need to create an awareness of the benefits deriving from partnerships, association membership and adherence to a common conservation ethic. Accredited zoos and aquariums should create incentives to bring about change in collections which are not convinced of these benefits. The strongest incentive may be to reinforce the fundamental belief that an individual's actions should have merit in the eyes of a greater community. In this regard, recognized, *bona fide* zoos and aquariums will be quick to support and encourage facilities taking their first steps towards developing partnerships. This will help them to fully appreciate the merit and benefits of networking and partnerships.

Recommendations

The World Zoo and Aquarium Conservation Strategy (WZACS) strongly recommends that zoo and aquarium partnerships and networks be established or strengthened at local, national, regional and international levels.

The WZACS reminds all zoos and aquariums that they must comply with the legislation and policy that affects conservation and animal welfare.

The WZACS maintains that all zoos and aquariums should be or should strive to be members of a regional and/or national zoo association.

The WZACS recommends that regional and national associations should make every effort to produce and present a conservation conscience appropriate to their culture within their member institutions, and to bring the activities of all their members into a common ethical and technical framework.

The WZACS urges national and regional associations to persuade their respective governments to improve or create zoo and aquarium legislation that will help zoos and aquariums to undertake their conservation purpose.

The WZACS urges those countries that do not have zoo and aquarium legislation to use and adapt the existing relevant legislation of other countries when formulating their own policies and regulations, and to seek the help of those zoo and aquarium associations where legislation already exists.



Chapter 8

Sustainability



Summary

This chapter presents a vision of all zoos and aquariums working towards sustainability and reducing their 'environmental footprint', by using natural resources in a way that does not lead to their decline. They will also provide examples to visitors of how they can 'green' their lifestyles. Sustainability is defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. It embodies social, economic and environmental dimensions. The 'Earth Summit' in Rio in 1992 set out 27 principles for sustainable development, including Agenda 21, and the subsequently developed ISO 14000; these principles address environmental management and pollution prevention. From these, a set of eight guiding principles can support zoos and aquariums in developing objectives and activities for sustainability: 1) use environmentally sound waste management, 2) be energy efficient, 3) use natural resources responsibly, 4) if you pollute, you pay, 5) put local consumption first, 6) contribute to equitable development, 7) apply the precautionary principle, and 8) encourage public awareness and participation. By becoming models for sustainability, zoos and aquariums can become champions for environmental responsibility, enhance compliance with environmental principles and help inform and shape future legislation. The chapter outlines four ways for zoos and aquariums to initiate and develop sustainable practices, by: encouraging environmental interest groups ('green teams'), developing an environmental management system, registering and gaining ISO 14001 accreditation, and aiming for 'animal embassy' responsible tourism accreditation. These initiatives need to be supported by organizational environmental policies and environmental audits. In summary, zoos and aquariums practising environmental sustainability can influence attitudes and change behaviour. In these ways they can contribute to the conservation of the whole planet.

Vision

All zoos and aquariums will work towards sustainability and reduce their 'environmental footprint'. They will use natural resources in a way that does not lead to their decline, thus meeting the needs of the present without compromising future generations. All zoos and aquariums will serve as leaders by example, using green practices in all aspects of their operations and by demonstrating methods by which visitors can adopt sustainable lifestyles.

8.1 Introduction

Zoos and aquariums are progressively contributing more to the conservation of biological diversity. They undermine this aim, however, if they work in ways that contribute to the depletion of natural resources. If they adopt measures and activities that help to sustain the natural resource base, they not only reduce this risk, but also add impetus to biodiversity conservation efforts.

Every zoo and aquarium has an environmental 'footprint' because the operations of every institution have a collective impact on the environment. The extent and effect of this footprint will vary considerably. For example, institutions with

animal collections requiring substantial and complex life support systems generally have higher energy and water usage. Some institutions will have to make bigger changes than others if they are to approach sustainability. For many, achieving the 'sustainable zoo' or 'sustainable aquarium' appears daunting and seems far removed from the day-to-day tasks of keeping the institutions viable. This is particularly true for those institutions in the less developed and poorer parts of the world. Nevertheless, every zoo and aquarium must reduce its environmental footprint. The zoological community must initiate and increase those activities that will achieve reduction, and embrace the concept in principle and practice.



8.2 Sustainability

Achieving sustainability can be defined as reaching a state where all operations of a zoological institution are neutral in the environment. To measure this accurately is challenging and, because development continues apace worldwide, involves continuous operational adjustments and repeated measurement. A more practical definition is that of the World Commission for Environment and Development (Brundtland Report): 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. This definition embodies three dimensions: social, economic and environmental.

The United Nations Conference on Environment and Development in Rio de Janeiro 1992, the 'Earth Summit', was a landmark event in the evolution of sustainable development. Several agreements important for zoos and aquariums were produced there. They included the Rio Declaration on Envi-

ronment and Development, Agenda 21, the Statement of Principles for the Sustainable Management of Forests, the Framework Convention on Climate Change and the Convention on Biological Diversity.

The Rio Declaration sets out 27 principles for sustainable development. Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the UN system, by governments and by major groups in every area where humans have an impact on the environment. An important aspect of the Earth Summit was the participation of the International Organization for Standardization (ISO; www.iso.org), which resulted in ISO 14000, a group of standards dealing with sustainability and environmental management. It includes ISO 14001, which addresses environmental management and pollution prevention.

8.3 Guiding principles for the sustainable zoo or aquarium

From the above main sources, we can present a set of eight guiding principles under which any zoo or aquarium can define its objectives and activities for sustainability. Through the practical application of these guiding principles, a zoo or aquarium will be able to defend its sustainable practices under accreditation scrutiny.

Use environmentally sound waste management

- Minimize the total production of waste.
- Manage separation of waste at source to encourage maximum re-use and recycling.
- Minimize the risk of polluting.

Be energy efficient

- Maximize energy efficiency in all on-site and off-site operations.
- Try to reduce travel-related energy consumption.
- Efficiently maximize the use of energy which is produced and distributed, especially from renewable sources.
- Apply the three Rs – reduce, re-use, recycle – where possible.

Use natural resources responsibly

- Use products that embody the most efficient and least environmentally damaging use of renewable and non-renewable natural resources. This applies to products from major construction materials to daily consumables, and should apply back along the supply chain to source.
- Apply the three Rs.
- Make sure that animal acquisitions and dispositions are not only sustainable environmentally but also ethically ac-

ceptable.

If you pollute, you pay

- Support the general principle that the polluter should not pass on to others the cost of cleaning up pollution.
- Apply the principle in your own institution as a measure of good practice.

Put local consumption first

- Maximize the proportion of goods and services that come from local providers with acceptable environmental practices.
- Reduce the environmental impact of transportation wherever feasible.

Contribute to equitable development

Keep in mind that sustainable development requires a reduction in the differences of living conditions across the world and that you can contribute to this by:

- conducting activities that contribute to this ideal;
- supporting conservation projects that embody this general principle
- adjusting purchasing policies and practices to help.

Apply the precautionary principle

- Obtain and analyse as much information as possible before making a decision.
- When in doubt, put in place measures to reduce environmental impact.



Encourage public awareness and participation

- Use the zoo's or aquarium's educational resources to help people understand why changes are important and what

they can do personally to live in a more sustainable manner.

- Set an example for other businesses in Earth-friendly operations.

8.4 Benefits of sustainability

People often ask, 'What will sustainability cost?' This is a valid concern, and underlines the importance of introducing sustainable practices in a way that improves the economic viability of zoos or aquariums. A more sustainable zoo or aquarium should expect to make cost savings through green practices, and they will become a more attractive option to visitors, donors, investors, insurers and partners and thus increase net income. They should stress sustainable activities as a basis for promotion and marketing.

Other benefits are less tangible but just as important. A zoo or aquarium that introduces sustainable practices will, without doubt, help to improve the environment and will fulfil the institution's moral imperative to be involved in such practices – as must all other sectors of society. It can be argued that the zoological community has greater environmental responsibilities than many other institutions and the adoption of sustainable practices will help meet its obligations; biodiversity conservation without actions for sustainability is incomplete. Zoos

and aquariums will stand as a model for sustainable practices, encouraging others, especially in the same community, and, if they are publicly owned, setting an example for 'greener' government.

By encouraging others in regional zoological associations to adopt sustainable practices, zoos and aquariums will improve their image as champions for environmental responsibility, enhance compliance with environmental principles and, even better, help to inform and shape future legislation. They will also improve employees' awareness of environmental issues and responsibilities, enhance employee morale and help to ensure that the institution is seen as a desirable employer. Moreover, they will significantly promote the concept to their visitors and will qualify for official awards and recognitions.

Many of these benefits were examined in detail at the 1st International Symposium on Environmental Management in Zoos held in 2001 in Denmark at the Aalborg Zoo.

8.5 Implementing sustainable practices

This section outlines four possible ways for zoos and aquariums to initiate and improve sustainable practices. These are presented as guidelines to help all zoos and aquariums, although it is realized that there are cultural, social and financial differences that affect the way the practices can be implemented. Further details can be found in the companion manuals which will follow this publication. Zoos and aquariums will adopt the best combination of these measures to achieve their goal of sustainability.

Environmental interest groups

Many zoos have 'green teams' or other groups for which staff can volunteer. A zoo or aquarium seeking sustainability will encourage these initiatives. Such groups can help management identify priority issues to tackle, research green options, conduct audits, and help implement and even establish environmental policies.

Environmental management systems

An environmental management system (EMS) is a set of processes and practices that enables an organization to reduce its environmental impacts and increase its operating efficiency. Developing an EMS is a structured way to reach goals of sustainability. An EMS stresses the importance of health and safety

alongside environment. It should lead to continual improvement through a structured process of planning, implementing, checking, reviewing and acting to make necessary changes.

An EMS can be based on standards already available, and zoos and aquariums should adopt the one most appropriate to their circumstances. Some countries have developed their own EMS standards, as have some regions. An example is the European Union's Eco-Management and Audit Scheme (EMAS).

ISO 14001

ISO 14001 is a comprehensive, global standard for an EMS which stipulates that all members of the organization participate in environmental protection. It considers all stakeholders, and sets out processes to identify all environmental impacts. It is proactive, focusing on forward thinking and action. ISO 14001 stresses improving environmental protection by using a single EMS across all functions of the organization. It does not measure performance or product; rather, it allows institutions to measure how their activities affect the environment.

To register and gain ISO 14001 accreditation, a zoo or aquarium must have an EMS. ISO 14001 is broadly recognized across public and private sectors. As more and more zoos and aquariums are accredited with ISO 14001, there will be greater



recognition of, and benefit to, the zoo community from government, corporations and society at large.

‘Animal Embassy’

‘Animal Embassy’ is an international standard of environmental responsibility with specific application to zoos and aquariums. It unites animal management and other standards with environmental criteria like those covered by ISO 14001. It is being

developed by the Institute of Responsible Tourism and Loro Parque in Spain, and will require participating institutions to have an EMS.

There are various certification schemes for green tourism, but ‘Animal Embassy’ is the only one to target zoos and aquariums. It especially relates zoos and aquariums to sustainable tourism, but it offers a helpful step towards ISO 14001.

8.6 Environmental policies

Integral to the above structures are environmental policies and audits. By stating its environmental policies an organization can crystallize goals and objectives to create an atmosphere of awareness. Clear expressions of intent can also have a positive external influence, encouraging others to help to put the policy into action.

Senior management must be responsible for producing the environmental policy, including the initial assessment and review of environmental conditions that guide the policy’s production. It is important to involve all staff and volunteers at all stages.

8.7 Environmental audits

An environmental audit measures and assesses the environmental impacts that a zoo or aquarium’s activities have on its surroundings. It also takes into consideration historical and potential future impacts. An environmental audit is a first step in a successful EMS. The preparation of an environmental baseline assessment, with input from all staff, is the starting point for an audit cycle. Self-assessment, with or without external assistance, not only is important at the start, but will continue to

be an essential part of maintaining an EMS, even though a third-party independent audit may be a desired goal. In 2003 the Aalborg Zoo in Denmark and North Carolina Zoological Park, USA were the only zoos to have a completed environmental audit cycle and to have attained ISO 14001 for their EMSs. In achieving the vision of sustainability, many other zoos and aquariums will follow Aalborg’s and North Carolina’s example.

Recommendations

The World Zoo and Aquarium Conservation Strategy (WZACS) strongly recommends that all zoos and aquariums adopt measures and activities that help sustain natural resources.

The WZACS recommends that all zoos and aquariums have a written environmental policy and undertake environmental audits.

The WZACS urges all zoos and aquariums to practise environmental sustainability, for by showing by example how sustainability can be achieved, social attitudes and behaviour can be changed; zoos and aquariums can thus be shown to be contributing to the conservation of entire ecosystems.

Many zoos behave in an environmentally friendly way by re-using the water needed for ponds, moats, pools or tanks, and save a lot of money by doing this. However, still relatively few make an educational issue of their practice, although visitors should be told that fresh water is a natural resource, which is not inexhaustible and should be used responsibly.

Photo: Johannesburg Zoo’s water purification system.

Peter Dollinger, WAZA Executive Office



WZACS 2005

Chapter 9

Ethics and Animal Welfare



Summary

This chapter outlines a vision of zoos and aquariums working ethically and maintaining the highest standards of animal welfare in their management of viable populations for conservation; they will thus convey credible conservation education messages to the public. The World Association of Zoos and Aquariums (WAZA) Code of Ethics and Animal Welfare represents the common ground on which WAZA members base their ex situ management and in situ conservation activities. Actions taken should be in the context of species survival, without compromising individual welfare. Animal acquisition and disposition policies are covered, with discussion of the realities of population management. In collections, where predation, disease, and food shortages do not occur, breeding programmes have the potential to produce a surplus. Zoos and aquariums are urged to keep surpluses to a minimum and to consider transfer to other accredited institutions, release into semi-reserves, or release to the wild as part of a coordinated conservation programme, or temporarily preventing reproduction. The disadvantages of long-term contraception are also discussed. If nothing else is feasible, a quick, painless, stress-free death should be considered as a last resort. Collections must provide suitable environments which meet animals' physical and psychological needs. Enrichment activities should be part of routine husbandry. Zoos and aquariums are encouraged to use evidence-based assessments of animal welfare and to use the results when designing enclosures. The chapter mentions a range of policies and procedures which zoos and aquariums should adhere to. Lastly, zoos and aquariums are urged to aim high and exceed legislated standards, thus establishing themselves as responsible organizations which can be trusted to provide the best care for their animals.

Vision

All zoos and aquariums will follow ethical principles and maintain the highest standards of animal welfare in order to establish and sustain viable populations of healthy animals for conservation purposes and to convey credible conservation messages to the public.

9.1 Introduction

Ethics can be defined as the philosophical study of the nature and grounds of moral thought and action. Practical ethics and the analysis of arguments that lead to particular moral conclusions are often coded into ethical principles, sometimes termed codes of practice. Ethical principles and moral behaviour are defined and justified in various ways in different societies, cultures, and religions.

Zoos and aquariums have a moral obligation to contribute to the conservation of habitats and biodiversity in the interests of society and of the animals themselves.

Zoos and aquariums must always consider both their visiting public and their resident animals. The existence of zoos and aquariums depends on their ability to provide strong ethical justifications for maintaining living collections and to demonstrate exceptional attention to the welfare of the animals in

their care. The views and the sentiments of visitors and the media are continually changing and the resultant ethical and welfare debates should be viewed as a continual process of critical thought and deliberation.

In the context of this document, animal welfare deals with the behaviour of humans in relation to the individual animal. In every situation where the use of animals for conservation is in conflict with animal welfare then zoos and aquariums must carefully consider and decide which one of these should be given priority. In making these decisions zoos and aquariums should consider that while species survival is a high ideal, it can never justify suffering of animals in their care.

All zoos and aquariums must be widely trusted as caretakers of animals and focus not only on the ultimate goal of conserva-



tion, but also on meeting the immediate needs of the living creatures for which they are responsible.

WAZA has adopted a Code of Ethics and Animal Welfare which is accepted by its constituency throughout the world, in spite of regionally differing ethical concepts and welfare considerations (Box 9.1). This Code represents the common ground on which WAZA members base their *ex situ* management and *in situ* conservation activities. All Institution, Association and Affiliate members of WAZA have to sign a Memorandum of Agreement to the effect that they will comply with the Code.

In addition, regional and national zoo and aquarium associations and individual institutions have their own codes of ethics, and some have detailed animal husbandry guidelines, that take into account their own specific social and cultural situations.

Most of the regional and national associations' codes are more detailed and stricter than the WAZA code, which as an umbrella organization has to take into account the views and situations of all its members.

Zoo and aquarium associations establishing codes or guidelines should strive to set higher requirements than the legal minimum standards applicable in the geographic area in which they operate.

It is essential that all zoo and aquarium associations follow their agreed codes of practice and the animal welfare standards of the associations.

Box 9.1

WAZA Code of Ethics and Animal Welfare

Preamble

The continued existence of zoological parks and aquariums depends upon recognition that our profession is based on respect for the dignity of the animals in our care, the people we serve and other members of the international zoo profession. Acceptance of the WAZA World Zoo Conservation Strategy is implicit in involvement in the WAZA.

Whilst recognising that each region may have formulated its own code of ethics, and a code of animal welfare, the WAZA will strive to develop an ethical tradition which is strong and which will form the basis of a standard of conduct for our profession. Members will deal with each other to the highest standard of ethical conduct.

Basic principles for the guidance of all members of the World Association of Zoos and Aquariums:

- (i) Assisting in achieving the conservation and survival of species must be the aim of all members of the profession. Any actions taken in relation to an individual animal, e.g. euthanasia or contraception, must be undertaken with this higher ideal of species survival in mind, but the welfare of the individual animal should not be compromised.
- (ii) Promote the interests of wildlife conservation, biodiversity and animal welfare to colleagues and to society at large.
- (iii) Cooperate with the wider conservation community including wildlife agencies, conservation organizations and research institutions to assist in maintaining global biodiversity.
- (iv) Cooperate with governments and appropriate bodies to improve standards of animal welfare and ensure the welfare of all animals in our care.
- (v) Encourage research and dissemination of achievements and results in appropriate publications and forums.
- (vi) Deal fairly with members in the dissemination of professional information and advice.
- (vii) Promote public education programmes and cultural recreational activities of zoos and aquariums.
- (viii) Work progressively towards achieving all professional guidelines established by the WAZA.

At all times members will act in accordance with all local, national and international law and will strive for the highest standards of operation in all areas including: animal welfare, use of zoo based animals, exhibit standards, acquisition of animals, transfer of animals, contraception, euthanasia, mutilation, research using zoo based animals, release-to-the-wild programmes, deaths of animals whilst in care, and external wild animal welfare issues.

More detail is given in the full text of the Code at www.waza.org



9.2 Ethical issues

Ethical problems often arise because of conflicting interests. In some cases a solution can be found by following existing legislation, guidelines or standards. In other cases the conflict can be solved by weighing competing values, and these considerations are often complex and dependent on context. In many cases the WAZA Code of Ethics and Animal Welfare, or the guidelines issued by WAZA or by IUCN provide an approach to solutions.

In practice there could be a conflict of interest between the conservation of a species or population and the welfare of an individual animal. According to the WAZA Code, actions taken in relation to an individual animal must be undertaken in the context of species survival, although the welfare of the individual animal should not be compromised. Animal welfare must be taken into account when an animal is in human care. The release of animals must strictly follow the IUCN Guidelines for Re-introductions, which offer general, practical policy guidance for any reintroduction, including details of preparation and follow-up.

Wild animal collections

Zoos and aquariums should not keep animals in conditions which pose a risk of injury or disease to visitors. In particular, they must ensure that animals that may have direct contact with visitors are not carriers of zoonotic diseases. An institution that holds a collection, which is considered to pose a major risk to public health, must assess that risk and if necessary take remedial action; if the public perceives a risk this will compromise the institution's conservation messages.

Zoos and aquariums should always be aware that invasive exotic animal and plant species are a potential threat to the indigenous fauna and flora. They should ensure that exotic animals in their care do not escape and pose a risk to indigenous species. They should also be careful in the selection of plant species for landscaping, and aquariums should ensure that no water plants, or parts or seeds thereof, can get into natural waters.

Acquisition of animals

The World Zoo Conservation Strategy published in 1993 stated 'that the commercial wild animal trade as a source of zoo animals should cease as soon as possible. Such animals as must be collected from the wild, must be collected for specific educational and conservation purposes. They should not be chosen from dealers' lists of animals randomly collected for commercial purposes. The Strategy also takes the long-term view that the placing of price tags on zoo animals may be counter-productive to fostering true conservation-based programmes. It therefore endorses the nil commercial value on conservation-sensitive zoo animals and requires that all national and supranational zoo associations develop policies towards the elimination of price tags

where these still exist.' These goals, while closer than in 1993, are still valid. (See also Chapter 4.)

All zoo and aquarium associations should develop and implement animal acquisition policies, to ensure that the actions of their members do not jeopardize the animals that are brought into their facilities, and to minimize the impact on wildlife populations. All zoos and aquariums must be accountable for how and where they obtain their animals. Ethical considerations must be taken into account even when acquisitions meet all legal requirements and association and institutional requirements; policies must be constantly evaluated to reflect new considerations and information.

It is general practice for zoos and aquariums to obtain animals from each other, usually by exchange, as loans or gifts, and in some countries, when rescued from unsuitable circumstances. If a zoo or aquarium is asked by a government agency or an accredited organization to provide a home for confiscated wild animals, they must comply with the 'WAZA Guidelines on the acceptance of seized or confiscated animals'. They should try to be helpful but if possible should accept confiscated animals only if they have the necessary expertise and can ensure appropriate care and accommodation.

Acquisitions from the wild that have been proven to be a necessary supplement for the maintenance of a managed population are acceptable only if all the legal obligations are fulfilled, and their acquisition does not have a deleterious effect on the wild population. Taking individuals of a species threatened with extinction is acceptable only if there are measures and plans in place to ensure the long-term maintenance of the *in situ* population.

Under no circumstances may zoos and aquariums be involved in illegal or unjustified trade of wild animals. The removal of animals from wild populations must: (1) be in compliance with international treaties, and regional and national legislation, (2) not threaten the long-term survival or recovery of that species in the wild, and (3) be done in cooperation with the responsible authorities of the country of origin. Animals that come from the wild must offer a contribution to the maintenance of their wild conspecifics, either through their optimal use in educational programmes, and/or by contributing to the conservation of threatened species within the framework of breeding and research programmes.

Disposal of animals

Ethical considerations should always be a part of animal disposition policies and as such should evolve along with an understanding of the needs of an animal in care. The WAZA Code of Ethics and Animal Welfare acknowledges that animals to be disposed of by member institutions should be sent to other in-



stitutions or organizations where they will receive the same high standards of care throughout their lives.

Zoos and aquariums must seek to ensure that the basic husbandry and welfare needs of their animals are being met even after they leave their institutions.

Population management

Animals in zoos and aquariums must be kept in a manner that takes into account their natural behaviour, including the opportunity to reproduce. Conditions suitable for reproduction in collections should mirror as much as possible those in the wild. However, while in the wild reproduction often leads to a much larger number of animals than can survive, predation, disease, food shortages, competition, climatic changes, and emigration will reduce these numbers. Successful breeding programmes in zoos and aquariums, where these factors are absent or controlled, have the potential to produce surpluses.

Zoos and aquariums, particularly those involved in cooperative animal management programmes, have a duty of responsibility, in compliance with animal welfare standards, to regulate the size of their animal stocks. Surplus animals can be: (1) transferred to other responsible zoos, aquariums, or similar institutions, (2) released into semi-reserves, (3) released into the wild in the framework of a coordinated conservation programme, or (4) temporarily prevented from reproducing. If none of these possibilities is feasible without causing suffering, adversely affecting group behaviour, or compromising the continued existence of the *ex situ* population, then it may be necessary to consider euthanasia. If practised within an ethical policy, euthanasia can be part of population management, thus replacing normal loss in nature. Euthanasia, which for some people is ethically wrong, should be considered only when all other possibilities have been reviewed; the issues involved must always be handled sensitively.

Every effort should be made not to produce surplus animals, and consideration should be given to the establishment of facilities where animals not intended for breeding (e.g. bachelor herds), or post-reproductive individuals, can be kept under suitable conditions.

9.3 Welfare issues

Zoos and aquariums cannot replicate the wild but, as far as possible, they should reproduce the animal's natural environment and take into account the animal's behavioural and physiological needs.

Most countries in which WAZA operates regulate animal welfare by law. Such laws specify how people must behave towards

Zoo and aquarium staff should however be aware that preventing animals from breeding may have negative effects on the health and well-being of the individual, the functioning of social groups and the long-term maintenance of *ex situ* populations. The maintenance of post-reproductive animals may occupy much needed space and also may give rise to suffering due to age-related diseases. However, the full process of reproduction, such as courtship, pair formation, mother-infant attachments, and socialization of young, can often have positive effects on individuals and can be said to enrich their lives. There can be objective welfare reasons in favour of breeding and there can be objective welfare reasons for euthanasia or culling under certain circumstances. If the animal experiences a quick death in a fear-free environment then killing is not a welfare issue, although it is recognized that objections could be raised on anthropocentric ethical grounds. Such concerns must be taken seriously but must also be judged against welfare and conservation principles.

Zoos and aquariums should keep the number of surplus animals as low as possible. Limiting reproduction and management euthanasia are two of the many options that need to be considered by population managers, and what action is subsequently taken will vary with country and culture. Institutions should explore all other options before going ahead with euthanasia, and they must explain to the public, media and staff why it is considered necessary in terms of maintaining healthy animals and populations.

If an animal has to be killed for management reasons, the institution will ensure that death is quick, painless and as stress-free as possible.

Release-to-the-wild programmes

The WAZA Code of Ethics and Animal Welfare requires that all release-to-the-wild programmes be conducted in accordance with the 'IUCN Guidelines for Re-introductions' officially adopted in 1995. This means that no release-to-the-wild programme shall be undertaken without the animals having undergone a thorough veterinary examination in agreement with The World Organisation for Animal Health (OIE)/IUCN quarantine and health screening protocols to assess their fitness for release. Their welfare post-release should be reasonably safeguarded, and a long-term monitoring programme should be established and maintained. (See also Chapter 2.)

animals and in what conditions animals must be kept. In particular they require that animals be free to express 'normal' behaviour and they do not suffer from thirst, hunger and malnutrition, pain, injury and disease, discomfort, fear and distress.

In addition, laws and regulations may specifically define the requirements under which wild animals must be kept. Laws and



regulations may be reviewed periodically and the general trend is for higher standards to be introduced. The policy of WAZA is to encourage zoos and aquariums to surpass the current minimum requirements in order to maintain populations of healthy and behaviourally undisturbed animals for conservation purposes, and to convey positive conservation messages to the public.

There have been many advances in zoo animal husbandry in recent years and the goal of all collections should be to ensure high welfare standards based on the best available science. This will be achieved mainly by the development of animal husbandry guidelines to which all zoos and aquariums will be expected to adhere.

Unlike many of their counterparts in the wild, animals in zoos and aquariums are well fed and cared for, and at no risk of predation or starvation. The fact that they do not have the same space for movement as in the wild should not normally compromise their welfare, as long as the size and design of their enclosures, the size and composition of their group, and husbandry procedures allow them to express their normal behaviour.

9.4 Conclusion

Zoos and aquariums in the 21st century bear a tremendous responsibility for the animals in their care and in helping to conserve biodiversity. If zoos and aquariums are to remain relevant in today's society, they must constantly challenge themselves in the way they respond to their responsibilities. They should continually question their ethical philosophies and their moral codes. They must ensure that the animals in their collections are provided with their behavioural and physiological needs and ensure that the animals play their role in conservation as managed reserve populations and as true ambassadors for their counterparts in the wild.

It is especially important that the public also understand the realities of conserving wildlife and biodiversity and supports the conservation role of zoos and aquariums. At present there is considerable confusion about the concepts of rights, ethics, wel-

All zoos and aquariums should ensure that the animals in their care, including those animals not on public view, are kept in conditions which allow them to express normal behaviour.

In addition to an enclosure of adequate size and structure, enrichment activities may be necessary to cater for the variety of behaviours and experiences that would be common in the wild. Environmental enrichment has been defined as 'an animal husbandry principle that seeks to enhance the quality of animals' care by identifying and providing the environmental stimuli necessary for optimal psychological and physiological well-being'. Although many collections already use enrichment techniques, the science is still relatively new and more research and evaluation is needed. At least one regional association, the American Zoo and Aquarium Association, requires its members to have an environmental enrichment plan for their collection and show evidence of implementation.

The scientific study of animal welfare is now well established and zoo and aquarium staff need to be aware of and use the expertise and literature that is available. Assessments of welfare should be evidence-based and staff should be to assess their animals encouraged objectively for signs of adverse responses to their environment. It is particularly important that the results of such assessments are fed back into optimum enclosure design.

fare and conservation and the implications that these have on conservation and wildlife management policies. Zoos and aquariums should have a critical and pivotal role in resolving this confusion. Forums, involving staff and the public, should be created for the discussion and resolution of the issues.

The ethical and welfare issues involved in managing wild animals in collections need to be constantly assessed and evaluated. This is essential for the future of zoos and aquariums and for their ability to implement their core missions of conservation, education and science. Such goals will only be met when zoos and aquariums have the trust of their visitors and donors. All members of the WAZA network must strive to meet the highest standards of animal care and continue to search for new ways to expand and improve their efforts to conserve wildlife and habitats.

Recommendations

The World Zoo and Aquarium Conservation Strategy (WZACS) recommends that all zoos and aquariums seek continually to improve their management techniques and the profession's current practices, based on evolving knowledge and sensibilities.

The WZACS recommends that all zoo and aquarium associations have their own ethical codes and animal welfare policies, and that the associations ensure that their members comply with them.



The WZACS requires that zoos and aquariums acquiring animals of threatened species from the wild will fully comply with the 'IUCN Technical Guidelines on the Management of *ex situ* Populations for Conservation'.

The WZACS requires that all animal transportation must be in accord with regulations, such as the International Air Transport Association's 'Live Animals Regulations', and with relevant national regulations.

The WZACS requires that zoos and aquariums undertake every effort to prevent the escape of animals and plants of alien invasive species.

The WZACS calls upon all zoos and aquariums to comply with legal requirements under which animals must be kept but points out that legislation can only define minimum standards and the zoo and aquarium community should strive for even higher standards.

The WZACS advises that if there are legal or cultural reasons why the killing of surplus animals is not an acceptable option, and the prevention of reproduction would damage the health or cause suffering of the animals concerned, and if the surplus animals cannot be kept in acceptable welfare conditions, then the zoo or aquarium should not have these animals in their collection and they should consider the option of transferring them to another collection.

The WZACS recommends that all regional and national associations develop peer-reviewed animal husbandry guidelines, in particular for species that are managed by cooperative *ex situ* breeding programmes.

The WZACS recommends that zoos and aquariums provide environmental enrichment and should direct resources toward exploring ways that enrichment techniques can be expanded, improved and evaluated.

The WZACS recommends that more use be made of evidence-based objective welfare assessments, and that the results be used to improve the environment of animals in collections.

The WZACS recommends that all zoos and aquariums become more familiar with the relevance of ethics and welfare issues in their conservation activities, and they should increase their efforts to educate and involve staff and the public.

The WZACS recommends that all zoos and aquariums should have an ethics committee and an ethical review process for all aspects of their operations, including those off site.

Breeding animals is necessary to maintain viable *ex situ* populations and allows the animals to express their normal reproductive behaviour – from courtship to the dispersal of the offspring. On the other hand, it is almost impossible to breed without producing surplus animals. Prevention of reproduction, however, has negative effects not only on the continued existence of the *ex situ* population and on the behaviour of the individuals or groups, it often has also a negative impact on body functions. Sexual cycles that do not lead to pregnancy have a pathological effect and can lead to premature infertility by irreversibly damaging the genital tract. The use of contraceptives suppresses cycle activity and, if used over the long term, may lead to dramatic changes in the female reproductive organs. Thus, reproductive management has both population/genetic and animal welfare implications.

Photo: Renaud Fulconis, Zoo d'Amnéville



Appendix I

Acronyms and Websites



African Association of Zoological Gardens and Aquaria	PAAZAB	www.paazab.com
African Preservation Programme of PAAZAB	APP	
American Association of Zoo Veterinarians	AAZV	www.aazv.org
American Zoo and Aquarium Association	AZA	www.aza.org
Animal Record Keeping System developed by ISIS	ARKS	
Association Nationale Française des Parcs Zoologiques	ANPZ	
Australasian Species Management Programme of ARAZPA	ASMP	
Australian Regional Association of Zoological Parks and Aquaria	ARAZPA	www.arazpa.org.au
Biodiversity Action Plan	BAP	
Botanic Gardens Conservation International	BGCI	www.bgci.org.uk
British and Irish Association of Zoos and Aquariums	BIAZA	www.biaza.org.uk
Central Zoo Authority	CZA	www.cza.nic.in
Colombian Association of Zoos and Aquariums	ACOPAZOA	www.acopazoa.zoobaq.org
Conservation Assessment and Management Plan	CAMP	
Conservation Breeding Specialist Group of the IUCN/SSC	CBSG	www.cbsg.org
Convention on Biological Diversity (1992)	CBD	www.biodiv.org
Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)	CITES	www.cites.org
Convention on Migratory Species (1979)	CMS	www.cms.int
Danish Association of Zoological Gardens	DAZA	www.daza.dk
Durrell Wildlife Conservation Trust's International Training Centre	DWT-ITC	www.durrellwildlife.org
Earthwatch		www.earthwatch.org
Environmental Management System	EMS	
Eurasian Regional Association of Zoos and Aquariums	EARAZA	www.zoo.ru
European Association of Zoo and Wildlife Veterinarians	EAZVV	www.eazvv.org
European Association of Zoos and Aquaria	EAZA	www.eaza.net
European Endangered Species Programmes of EAZA	EEP	
European Union's Eco-Management and Audit Scheme	EMAS	www.europa.eu.int/comm/environment/emas
German Federation of Zoo Directors	VDZ	www.zoodirektoren.de
Global Strategy for Plant Conservation	GSPC	www.bgci.org.uk/conservation/strategy.htm
Iberian Association of Zoos and Aquaria (Asociación Ibérica de Zoos y Acuarios - formerly Asociación Española de Zoos y Acuarios)	AIZA	www.aiza.org.es
Institute for Zoo and Wildlife Research (Institut für Zoo-und Wildtierforschung, Berlin)	IZW	www.izw-berlin.de
International Air Transport Association	IATA	www.iata.org
International Organization for Standardization	ISO 14000	www.iso.org
International Species Information System	ISIS	www.isis.org
International Takhi Group	ITG	www.takhi.org
International Zoo Educators Association	IZE	www.izea.net
Italian Union of Zoos and Aquaria	UIZA	
IUCN/SSC Guidelines for Re-introductions		www.iucn.org/themes/ssc/pubs/policy/reinte.htm
Japanese Association of Zoos and Aquariums	JAZA	www.jazga.or.jp/
Landcare Australia		www.landcareaustralia.com.au



Latin-American Zoo and Aquarium Association	ALPZA	
Madagascar Fauna Group	MFG	www.madagascarfaunagroup.org
Malaysian Association of Zoological Parks and Aquaria	MAZPA	www.mazpa.org.my
Mesoamerican & Caribbean Zoo & Aquaria Association	AMACZOOA	
National Foundation of Zoological Parks and Aquaria	FUNPZA	www.funpza.org.ve
Population and Habitat Viability Assessment	PHVA	
Ramsar Convention on Wetlands (1971)	RAMSAR	www.ramsar.org
Re-introduction Specialist Group of the IUCN/SSC	RSG	www.iucnsscrsg.org/pages/1/index.htm
Regional Animal Species Collection Plan	REGASP	
Smithsonian Institution's Conservation and Research Center		nationalzoo.si.edu/ConservationAndScience/CRC/
Sociedade de Zoológicos do Brazil	SZB	www.szb.org.br
South Asian Zoo Association for Regional Cooperation	SAZARC	www.zooreach.org
South East Asian Zoos Association	SEAZA	www.seaza.org
Species Survival Commission of the IUCN	SSC	www.iucn.org/themes/ssc
Species Survival Plan of AZA	SSP	www.aza.org/ConScience/ConScienceSSPFact/
Swedish Association of Zoological Parks and Aquaria	SAZA (SDF)	www.svenska-djurparksforeningen.nu
Swiss Association of Scientific Zoos - ZOOSchweiz	SASZ	www.zoos.ch
Syndicat National des Directeurs de Parcs Zoologiques Français	SNDPZ	www.sndpz.fr
The World Conservation Union (formerly called International Union of Nature Conservation)	IUCN	www.iucn.org
The World Organisation for Animal Health	OIE	www.oie.int
UNEP - World Conservation Monitoring Centre	WCMC	www.unep-wcmc.org
Union of Czech and Slovak Zoological Gardens	UCSZ	www.zoo.cz
United Nations	UN	www.un.org/
United Nations Development Programme	UNDP	www.undp.org
United Nations Educational, Scientific and Cultural Organization	UNESCO	www.unesco.org
United Nations Environment Programme	UNEP	www.unep.org
United Nations Millennium Development Goals		www.undp.org/mdg
Veterinary Specialist Group of the IUCN/SSC	VSG	www.iucn-vsg.org
Wild Chimpanzee Foundation	WCF	www.wildchimps.org
Wildlife Conservation Society	WCS	wcs.org
Wildlife Information Network	WIN	www.wildlifeinformation.org
World Association of Zoos and Aquariums	WAZA	www.waza.org
World Heritage Convention (1972)		www.unesco.org/whc
World Zoo and Aquarium Conservation Strategy	WZACS	www.waza.org
World Zoo Conservation Strategy (1993)	WZCS	www.waza.org
WWF - The Global Conservation Organization	WWF	www.wwf.org
Zoo Outreach Organization	Z.O.O.	www.zooreach.org
Zoological Information Management System	ZIMS	www.zims.org

For further reading and consultation see the publications listed in Box 3.4, and in the journals and other publications of regional and national zoo and aquarium associations. The title, acronym and website of individual zoos and aquariums can be found by searching the website of WAZA or the website of the relevant regional association.



Appendix 2

Glossary of Terms



adaptive management – type of natural resource management with decisions made as part of an ongoing science-based process; actions are designed so they provide useful information for future learning; monitoring and evaluation are critical components

Animal Embassy - an international standard of environmental responsibility with specific application to zoos and aquariums; unites animal management and other standards with environmental criteria like those covered by ISO 14001, and is being developed by the Institute of Responsible Tourism and Loro Parque in Spain

artificial selection – human intervention in animal or plant reproduction to ensure certain desirable traits are represented

biodiversity – biological diversity – the variety of living things

Biodiversity Action Plan – national and local response to Convention on Biological Diversity, which describes biological resources, a plan for their conservation, and specific actions focused on species and habitats

biosecurity – the management of deliberate or accidental unwanted animal and plant pests and diseases (e.g. new pests and diseases, invasive species, biological weapons)

buffer zone – neutral zone to soften boundary between different land use areas (e.g. multiple use area allowing some extraction, such as of honey or medicinal plants, around protected core area)

bushmeat – non-domesticated animals (wildlife) used as food, from termites to elephants, often collected and traded in an uncontrolled way

collection planning – strategic planning process carried out at an institutional, regional or global level to prioritize species, which incorporates numerous factors, such as conservation status, taxonomic uniqueness, education value, and availability of stock

contraceptive – agent or device intended to prevent conception or pregnancy by interfering with the process of ovulation, fertilization or implantation

demographics – study of factors that affect a population, such as birth and death rates

demographic management – management of a population by using demographic factors

demographic reservoir – pool of individuals (usually in a regional breeding programme) which represents a 'safety net' to increase numbers and potential breeders of a species with a reduced wild population

demographic stability – stable age distribution often measured by ability of a population to resist environmental disturbance by return to this equilibrium state; management of a breeding programme to maintain it within the carrying capacity of participating institutions

ecology – the study of the interrelationships of organisms and their environment

ecosystem – a dynamic complex of plant, animal and micro-organism communities and their non-living environment acting as a functional unit (e.g. rainforest, coral reef)

ecotourism – a tourism market based on an area's natural resources that attempts to minimize ecological impact (e.g. whale watching, trekking)

emerging disease – new or previously unrecognized bacterial, fungal, viral and parasitic diseases

endemic – species native to and restricted to a particular geographic area

environmental audit – comprehensive structured analysis of an organization's policies, practices and controls, usually calibrated against existing environmental laws

environmental footprint – often called ecological footprint – measures of how much productive land and sea is required to provide the resources used in everyday living, including calculations of emissions produced from fuel burnt and land needed to process waste

Environmental Management System - a continual cycle of planning, implementing, reviewing and improving the processes and actions that an organization undertakes to meet its business and environmental goals

environmental responsibility – using resources in an environmentally responsible and sustainable manner

environmental services – natural processes, such as provision of clean water, clean air, soil production, that are part of environmental functioning on a healthy planet but rarely taken into account when appraising natural resources

ethology – the study of animal behaviour

euthanasia – the act of putting painlessly to death

ex situ – away from a species' normal habitat (e.g. animal in a collection, plant in a seed store), cf. *in situ*

formal education – education through education institutions with formalized curricula



- founder stock** - individuals drawn from a source population who contribute genetically to the derived subpopulation (e.g. in a breeding programme usually wild-caught individuals who have produced surviving offspring)
- genetic adaptation** – process of natural selection whereby individuals increase in fitness within a particular environment
- genetic reinforcement** – the introduction of new genetic material or individuals into a population; usually done to increase genetic diversity in small, isolated, possibly inbred populations
- genetics** – the scientific study of genes and heredity; how particular qualities and traits are transmitted from parent to offspring
- genome bank** – often called gene bank – an archive of genetic information from (often endangered) species, from a variety of biological samples, especially gametes (oocytes and sperm)
- habitat fragmentation** – clearing or degradation of native vegetation where once continuous areas are split into isolated pieces; these may only support reduced populations and suffer from edge effects and changed microclimates
- health screening** – ongoing evaluation of health status; may involve clinical examination, haematology, parasitology, etc.
- holistic** – relating to the whole; an approach to something from multiple perspectives
- hotspot** – region harbouring great diversity of endemic species yet also heavily impacted by human activities; used as a way of establishing conservation priorities
- inbreeding** – mating among related individuals
- informal education** – self-directed (free choice) learning (e.g. through talks, sign boards, exhibits)
- in situ** – in a species' usual wild habitat, cf. *ex situ*
- ISO 14001** – international standards on environmental management, providing a framework for the development of an environmental management system, conformance and compliance with environmental policies and practices, and external audit
- invasive species** – a species that competes with native species for space and resources; usually exotic or introduced but native invasive species also exist
- low embodied energy materials** – materials which require less total energy to extract, manufacture, transport, construct, maintain and dispose of; in relation to ecological accounting, the goal is to reduce environmental impacts and energy expenditures over the life-cycle of a material or product
- mean kinship** – a numerical value reflecting how closely related each individual is to the population, giving a measure of how rare an individual animal's unique combination of genes is in the entire population; individuals with a lower mean kinship value have relatively fewer genes in common with the rest of the population, and are therefore more genetically valuable in a breeding programme
- metapopulation management** – management of a group of partially isolated populations of the same species (e.g. may involve exchange of individuals or genes between wild and collection populations)
- molecular genetics** – branch of genetics concerned with the structure and function of genes (e.g. how a gene is copied, how a mutation arises, and how genetic information is translated into the phenotype)
- morbidity** – a diseased or sickly state
- morphology** – the study of form and structure of organisms
- passive heating system** – use of solar energy to provide heat (e.g. through south-facing glass windows)
- pathogen** – a disease-causing organism
- pedigree** – a chart specifying lines of descent and relationships of individuals
- physiology** – scientific study of the processes and functions of an organism
- population ecology** – branch of ecology that studies structure and dynamics of populations; together with population genetics, comprises population biology
- recessive gene** – alternative form of a gene that will show in the observed characteristics (phenotype) of an organism only if its partner allele on the paired chromosome is similarly recessive
- reintroduction** – an attempt to re-establish a taxon in an area which was once part of its historical range, but from which it has been extirpated or become extinct, often using individuals from collections
- solar gain** – receiving energy from the sun (e.g. through windows); can be direct, indirect or insulated gain
- Species Recovery Programme** – set of activities designed to achieve the long-term self-sustained survival in the wild of an endangered animal
- stakeholder** – individuals or groups that are affected by a decision and have an interest in its outcome
- studbook** – detailed records of births, deaths and genetic relationships and other biological data which when analysed allow management of a population
- sustainability** – the concept of meeting the needs of the present without compromising the ability of future generations to meet their needs; in conservation terms, it refers to the use of a natural resource in a way whereby it can be renewed, such that the environment's natural qualities are maintained
- systematics** – term to describe the processes that describe species, including three disciplines: description of species (identification), taxonomy, and description of relationships among and between taxa (phylogenetics)
- taxon** – a group of organisms of any taxonomic rank, such as species, genus, or subspecific division
- taxonomy** – the science of classifying and naming organisms
- translocation** – deliberate movement of wild animals from one part of their range to another
- zoonotic disease** – disease caused by infectious agents that can be transmitted between, or are shared by, animals and humans



Appendix 3

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Kazu **Takami**, Osaka Municipal Tennoji Zoo, Japan; Kit Sun **Tan**, Singapore Zoo, Singapore; Kevin **Tanner**, Oceanis Australia Group, Australia; Richard **Tenaza**, Indonesia; Sue **Thornton**, International Zoo Veterinary Group, UK; Esteve **Tomàs**, Barcelona Zoo, Spain, AIZA and WAZA; Simon **Tonge**, Paignton Zoo, UK; Arshad **Toosey**, National Avian Research Centre, UAE; Kathy **Traylor-Holzer**, CBSG, USA; Eric **Tsao**, Taipei Zoo, Taiwan; Seppo **Turunen**, Helsinki Zoo, Finland.

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Jonas **Wahlström**, Skansen Akvariet, Sweden; Sally **Walker**, Zoo Outreach Organization, India, and SAZARC; Olivia **Walter**, BIAZA, UK; Chris **Walzer**, Salzburg Zoo, Austria, and ITG; David **Waugh**, Loro Parque, Spain; Felix **Weber**, ZOOSchweiz, Switzerland; Stephanie **Wehnelt**, Chester Zoo, UK; Chris **Wemmer**, Smithsonian Institution, Washington DC, USA; Chris **West**, Zoological Society of London, UK; Dan **Wharton**, Wildlife Conservation Society, New York, USA; Malcolm **Whitehead**, Wildfowl and Wetlands Trust, UK; Jonathan **Wilcken**, ARAZPA, Australia; David **Wildt**, Smithsonian Institution, USA; Roger **Wilkinson**, Chester Zoo, UK; Ekkhard **Wolff**, Schönbrenn Aquarium, Austria; Hon Mun **Wong**, Jurong Bird Park, Singapore; Stephen **Woollard**, Dudley Zoo, UK, and IZE; Rob **Young**, Universidade Catholica de Minas Gerais, Brazil.

Xie **Zhong**, Chinese Association of Zoological Gardens, China.



Experiencing another world – touch tank with sea stars. Photo provided by Kevin Tanner, Underwater World, Mooloolaba, Australia



3	Juvenile <i>ex situ</i> -bred Tuatara (<i>Sphenodon punctatus</i>)	Orana Wildlife Park, New Zealand	Peter Dollinger, WAZA
5	Black rhino (<i>Diceros bicornis</i>), rated 'Critically Endangered' by IUCN	Kenya	Renaud Fulconis, Chartres
7	Zoo-bred Lesser pandas (<i>Ailurus fulgens</i>) intended for release	Singhalila National Park, India	PNH Zoological Park, India
9	Close encounter with Alpine marmots (<i>Marmota marmota</i>)	Argelès Wildlife Park, France	Peter Dollinger, WAZA
	Experiencing marine life – children and jellyfish	Underwater World, Australia	Kevin Tanner, Mooloolaba
12	Outdoor enclosure for chimpanzees (<i>Pan troglodytes verus</i>) at 'Pongoland'	Leipzig Zoo, Germany	Peter Dollinger, WAZA
	WAZA Project 04020: Chimpanzee conservation at Tai National Park	Village near Tai NP, Ivory Coast	Christophe Boesch WCF
13	Masoala Hall, a zoo exhibit linked to the Masoala NP of Madagascar	Zurich Zoo, Switzerland	Peter Dollinger, WAZA
16	WAZA Project 04024: Protecting the Grévy's zebra (<i>Equus grevyi</i>)	Northern Kenya	Jeffrey Bonner, St. Louis
22	WAZA Project 04004: Testing releasing techniques for Waldrapp ibises	Jerez, Spain	Miguel A. Quevedo, Jerez
25	WAZA Project 03002: Sampling a Przewalski's horse (<i>Equus przewalskii</i>)	Gobi B, Mongolia	Chris Walzer, Salzburg
27	WAZA Project 03001: Establishing a migration tradition in Waldrapp ibises	Scharnstein, Austria	Johannes Fritz, Scharnstein
29	WAZA Project 04018: The Meso-American Conservation Center	Bosawas Reserve, Nicaragua	Cheryl Asa, St. Louis
30	Critically endangered 'Montserrat chicken' (<i>Leptodactylus fallax</i>)	DWCT – Jersey Zoo, British Isles	Peter Dollinger, WAZA
33	Post-release monitoring in California Condor (<i>Gymnogyps californianus</i>)	California, USA	Mike Wallace, San Diego
37	Environmental education initiated by the Madagascar Fauna Group	Ivoina, Madagascar	Priska Ketterer, Luzern
43	WAZA supports collaborative training efforts by training grants	AZA/MACCAP Workshop	Cheryl Asa, St. Louis
44	Køb ikke deres liv (Don't buy their lives): an exposition on CITES	Aalborg Zoo, Denmark	Peter Dollinger, WAZA
49	The Internet – an important means for communicating conservation issues	www.waza.org	Peter Dollinger, WAZA
50	Rangers training for protecting the previously locally extinct rhinos	North Luangwa NP, Zambia	Christian Schmidt, Frankfurt
58	Separation of waste and recycling – also an educational issue	Johannesburg Zoo, South Africa	Peter Dollinger, WAZA
60	Educating visitors about purification and recycling of water	Johannesburg Zoo, South Africa	Peter Dollinger, WAZA
61	Wild dog (<i>Lycaon pictus</i>) with killed Greater kudu (<i>Tragelaphus strepsiceros</i>)	Madikwe Game Reserve, South Africa	Peter Dollinger, WAZA
66	Maternal behaviour in a zoo lioness (<i>Panthera leo</i>)	Zoo d'Amnéville, France	Renaud Fulconis Chartres
67	WAZA Project 04016: Tree kangaroo (<i>Dendrolagus goodfellowi pulcherrimus</i>)	Wewak, Papua New Guinea	Jean Thomas, TCA, Wewak
69	Enrichment – Sun bear (<i>Helarctos malayanus</i>) opening a coconut	Melaka Zoo, Malaysia	Peter Dollinger, WAZA
71	The Sand cat (<i>Felis margarita harrisoni</i>) is managed under an EEP and an SSP	The Living Desert, Palm Desert	The Living Desert
73	Experience another world – touch tank with sea stars	Underwater World, Australia	Kevin Tanner, Mooloolaba
74	Ragged-tooth shark (<i>Carcharias taurus</i>) to be returned to the wild	Two Oceans Aquarium, South Africa	Pat Garrat, Cape Town

