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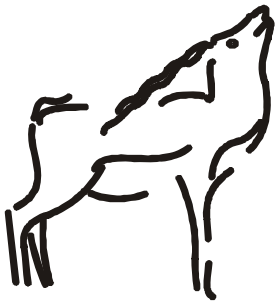

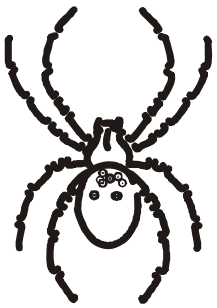

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ZOOS' PRINT is a magazine and intended to be informal and newsy as opposed to a scientific publication. ZOOS' PRINT magazine sometimes includes semi-scientific and technical articles are reviewed only for factual errors and are not peer-reviewed. Guidelines for submission of articles for ZP magazine are included in the next column. ZOOS' PRINT JOURNAL is no longer published in this name; it is now titled Journal of Threatened Taxa (online) and has international as opposed to regional scope. It can be viewed at www.threatenedtaxa.org.

ZOOS' PRINT magazine is available on subscription for Rs.250/- per year (add Rs.50/- for outstation cheques). The fee for membership in Zoo Outreach Organisation (also Rs. 250/-) includes a one-year subscription to ZOOS' PRINT and a membership card.

We welcome members who will agree to support zoos and captive breeding centres in a positive and constructive manner only. Members may be called upon to assist with educational and information gathering activities in their area.

GUIDELINES for ZOOS' PRINT MAGAZINE CONTRIBUTORS

We welcome articles from the conservation community of all SAARC countries, including Afghanistan, Bangladesh,Bhutan India, Maldives, Nepal, Pakistan, Sri Lanka . Articles from other tropical countries will also be considered if relevant to SAARC countries' problems and potential.

Type — Articles of semi-scientific or technical nature. News, notes, announcements of interest to conservation community are acceptable. Personal opinion pieces are also welcome.

Feature articles — articles of a conjectural nature — opinions, theoretical, subjective.

Case report — case study or notes — short factual reports and descriptions.

News and announcements — short items of news or announcements of interest to zoo and wildlife community

Cartoons, puzzles, crossword and stories

Subject matter : captive breeding, (wild) animal husbandry and management, wildlife management, field notes, conservation biology, population dynamics, population genetics, conservation education and interpretation, wild animal welfare, conservation of flora, natural history and history of zoos. Articles on rare breeds of domestic animals are also considered.

Source : Institutions such as zoos, breeding facilities, holding facilities, rescue centres, research institutes, wildlife departments, wildlife protected areas, bioparks, conservation centres, botanic gardens, museums, universities, etc. Also persons who are interested in conservation and have information and opinions to share can do so in ZOOS' PRINT magazine if their matter is considered useful and non-objectionable.

Manuscript requirements:
Articles should be typed with double spacing on one side of paper with generous margins.

Articles can include relevant photographs, illustrations, tables, etc. wherever necessary or desirable but photographs will not normally be used in the printed version. We will include them in the web version.

Articles which should contain citations should follow this guideline : a bibliography organized alphabetically and contain ing all details referred in the following style : surname, initial(s), year, title of the article, name of journal, volume, number, pages.

Editorial details :
Articles will be edited without consulta-tion unless previously requested by the authors in writing. Authors should inform editors if the article has been published or sub-mitted elsewhere for publication.

All articles will be reviewed by in-house group editors and those categorised as scientific, also by consultant editors.

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All Zoos contributing to Conservation

The purpose of the current series of reprinted material (see next four pages) in ZOOS' PRINT issues starting last month is to argue for captive breeding guidelines more along the lines of IUCN SSC Reintroduction Specialist Group guidelines, but (more importantly) which **begin at the beginning**, instead of in the middle, as current guidelines do. That is why with all the guidelines already printed, we need yet another one. Other reasons:

1. There are distinct advantages for zoos in countries which have not been sufficiently exposed to the full scenario of captive care needed for conservation breeding. Not all zoos are equal - many do not have the benefit of having learned systematic management of wild animal breeding for conservation.

2. There are multiple advantages for zoos. For example, in countries which are under an administrative system that transfers Directors and/or Veterinary Officers and/or Curators/Asst. Curators every few years (or months, even!), official IUCN based, conservation breeding guidelines will be invaluable, as most of the officers transferred in know nothing at all about zoo management.

3. There are advantages for other specialist groups, such as the Reintroduction Specialist Group whose Chair, Dr. Fred Launay feels that his job and that of RSG would be easier if there were very specific guidelines for different objectives and levels of breeding wild animals in captivity. Guidelines for *ex situ* breeding could cover exactly how animals intended for reintroduction must be housed, fed, and reared in order to make the fit physically, genetically and psychologically for release.

4. There are advantages for CBSG (Conservation Breeding Specialist Group), as Guidelines can be routinely updated often at CBSG meetings. It will enable CBSG to "level the playing field" of zoos in different parts of the world and it will expand and clarify the role of CBSG as the scientific "conscience" of zoos and as an objective facilitator and planner of zoo interactions with other zoos, wildlife agencies, animal welfare organisations, government organizations, etc. in the arena of conservation action.

The IUCN Technical Guidelines on Management of *ex situ* Populations for Conservation, reprinted in this issue along with an article "interpreting" them, were approved at the 14th Meeting of the Pgm Comm. of IUCN Council, 2002. It is an update of the IUCN Policy Guidelines of Management of *Ex Situ* populations for Conservation approved and published in 1987. Such documents have been written more for policy makers and some western zoos which were already on track. More than 90% of the zoos in the world could not make heads or tail of these documents in terms of applying them to real life in zoos. Neither of the IUCN statements, 1987 nor 2002 are a substitute for guidelines as referred here.

In the world today there may be 10,000 zoos, or even more. About 10% zoos come under the WAZA banner being either full members themselves or members of a regional or national zoo association. Most of the full members are on the right track but not all, and many regional or national association members, particularly in the developing regions, are not all able to contribute to conservation by captive breeding. Some countries, such as the United States mimics the percentage I mentioned globally. There are about 250 zoos that have been accredited by AZA "The Zoo Association" (in USA) and more than 2000 "other zoos" in USA alone.

While not all zoosare well-intentioned or oriented towards the goals and aspirations of the organised zoo community, many zoos and their owners and employees ARE well-intentioned, but still do not know where to begin in systematizing their breeding how to begin on the right foot if starting a new zoo. There is no single document which explains the "big picture" of zoo conservation sufficiently for the purpose of instruction. There is a need for such a document which must be simple, comprehensible, and easily translated into different languages. It should include the political and administrative, aspects of breeding as well as physiological aspects, such as even the decision of individual zoos at a particular time to breed for exhibition, education, research, and/or conservation. There is no reason why every zoo has to satisfy its conservation duty by breeding, except when it prevents the need to take animals from the wild for exhibition) –there are other conservation activities which will contribute to conservation other than breeding endangered species. The guidelines I have in mind would encourage, permit and empower zoos and zoo associations to scale down their objectives to what is realistic and possible for their budget and technical level instead of thinking it is imperative to breed threatened species.

Most of us in the zoo community can relate many instances of animals caught for captive breeding ostensibly for conservation by zoos which were not equipped to do the job. Those zoos have contributed to extinction and are even now.

Although it may seem I am being very hard on zoos, it is only because I see some huge gaps where gaps do not have to be. I have huge faith in zoos as instruments of conservation ... IF they know their own abilities and limits and stay within them, substituting some other conservation activity they can do well for breeding until they develop the expertise and infrastructure required. ***Submitted by Sally Walker, Editor Emeritus & Convenor, CBSG South Asia.***

IUCN TECHNICAL GUIDELINES ON THE MANAGEMENT OF *EX SITU* POPULATIONS FOR CONSERVATION

Approved at the 14th Meeting of the Programme Committee of Council, Gland Switzerland, 10 Dec 2002

PREAMBLE

IUCN affirms that a goal of conservation is the maintenance of existing genetic diversity and viable populations of all taxa in the wild in order to maintain biological interactions, ecological processes and function. Conservation managers and decision-makers should adopt a realistic and integrated approach to conservation implementation. The threats to biodiversity *in situ* continue to expand, and taxa have to survive in increasingly human-modified environments. Threats, which include habitat loss, climate change, unsustainable use, and invasive and pathogenic organisms, can be difficult to control. The reality of the current situation is that it will not be possible to ensure the survival of an increasing number of threatened taxa without effectively using a diverse range of complementary conservation approaches and techniques including, for some taxa, increasing the role and practical use of *ex situ* techniques.

If the decision to bring a taxon under *ex situ* management is left until extinction is imminent, it is frequently too late to effectively implement, thus risking permanent loss of the taxon. Moreover, *ex situ* conservation should be considered as a tool to ensure the survival of the wild population. *Ex situ* management should be considered only as an alternative to the imperative of *in situ* management in exceptional circumstances, and effective integration between *in situ* and *ex situ* approaches should be sought wherever possible.

The decision to implement an *ex situ* conservation programme as part of a formalised conservation management or recovery plan and the specific design of and prescription for such an *ex situ* programme will depend on the taxon's circumstances and conservation needs. A taxon-specific conservation plan may involve a range of *ex situ* objectives, including short, medium and long-term maintenance of *ex situ* stocks. This can utilise a variety of techniques including reproduction propagation, germplasm banking, applied research, reinforcement of existing populations and re-introduction into the wild or controlled environments.

The objectives and overall purpose should be clearly stated and agreed among organisations participating in the programme, and other relevant stakeholders including landowners and users of the taxon involved. In order to maximise their full potential in conservation, *ex situ* facilities and their co-operative networks should adopt the guidelines defined by the Convention on Biological Diversity (CBD), the International Agenda for Botanic Gardens in Conservation, Center for Plant Conservation and the World Zoo Conservation Strategy, along with other guidelines, strategies, and relevant legislative requirements at national and regional levels. IUCN recognizes the considerable set of resources committed worldwide to *ex situ* conservation by the world's zoological and botanical gardens, gene banks and other *ex situ* facilities. The effective utilisation of these resources represents an essential component of conservation strategies at all levels.

VISION

To maintain present biodiversity levels through all available and effective means including, where appropriate, *ex situ* propagation, translocation and other *ex situ* methodologies.

GOAL

Those responsible for managing *ex situ* plant and animal populations and facilities will use all resources and means at their disposal to maximise the conservation and utilitarian values of these populations, including:

1) increasing public and political awareness and understanding of important conservation issues and the significance of extinction;
2) co-ordinated genetic and demographic population management of threatened taxa;
3) re-introduction and support to wild populations;
4) habitat restoration and management;
5) long-term gene and biomaterial banking;
6) institutional strengthening and professional capacity building;
7) appropriate benefit sharing;
8) research on biological and ecological questions relevant to *in situ* conservation; and
9) fundraising to support all of the above. *Ex situ* agencies and institutions must follow national and international obligations with regard to access and benefit sharing (as outlined in the CBD) and other legally binding instruments such as CITES, to ensure full collaboration with all range States.

Priority should be given to the *ex situ* management of threatened taxa (according to the latest IUCN Red List Categories) and threatened populations of economic or social/cultural importance. *Ex situ* programmes are often best situated close to or within the ecogeographic range of the target taxa and where possible within the range State. Nevertheless a role for international and extra regional support for *ex situ* conservation is also recognised. The option of locating the *ex situ* programme outside the taxa's natural range should be considered if the taxa is threatened by natural catastrophes, political and social disruptions, or if further germplasm banking, propagation, research, isolation or reintroduction facilities are required and

cannot be feasibly established. In all cases, *ex situ* populations should be managed in ways that minimize the loss of capacity for expression of natural behaviours and loss of ability to later again thrive in natural habitats.

TECHNICAL GUIDELINES

The basis for responsible *ex situ* population management in support of conservation is founded on benefits for both threatened taxa and associated habitats.

• The primary objective of maintaining *ex situ* populations is to help support the conservation of a threatened taxon, its genetic diversity, and its habitat. *Ex situ* programmes should give added value to other complementary programmes for conservation.

Although there will be taxa-specific exceptions due to unique life histories, the decision to initiate *ex situ* programmes should be based on one or more of the appropriate IUCN Red List Criteria, including:

1. When the taxa/population is prone to effects of human activities or stochastic events or

2. When the taxa/population is likely to become Critically Endangered, Extinct in the Wild, or Extinct in a very short time. Additional criteria may need to be considered in some cases where taxa or populations of cultural importance, and significant economic or scientific importance, are threatened. All Critically Endangered and Extinct in the Wild taxa should be subject to *ex situ* management to ensure recovery of wild populations.

• *Ex situ* conservation should be initiated only when an understanding of the target taxon's biology and *ex situ* management and storage needs are at a level where there is a reasonable probability that successful enhancement of species conservation can be achieved; or where the development of such protocols could be achieved within the time frame of the taxon's required conservation management, ideally before the taxa becomes threatened in the wild. *Ex situ* institutions are strongly urged to develop *ex situ* protocols prior to any forthcoming ex situ management. Consideration must be given to institutional viability before embarking on a long term *ex situ* project.

• For those threatened taxa for which husbandry and/or cultivation protocols do not exist, surrogates of closely related taxa can serve important functions, for example in research and the development of protocols, conservation biology research, staff training, public education and fundraising.

• While some ex situ populations may have been established prior to the ratification of the CBD, all *ex situ* and *in situ* populations should be managed in an integrated, multidisciplinary manner, and where possible, in accordance with the principles and provisions of the CBD.

• Extreme and desperate situations, where taxa/ populations are in imminent risk of extinction, must be dealt with on an emergency basis. This action must be implemented with the full consent and support of the range State.

• All *ex situ* populations must be managed so as to reduce risk of loss through natural catastrophe, disease or political upheaval. Safeguards include effective quarantine procedures, disease and pathogen monitoring, and duplication of stored germplasm samples in different locations and provision of emergency power supplies to support collection needs (e.g. climate control for long term germplasm repositories).

• All *ex situ* populations should be managed so as to reduce the risk of invasive escape from propagation, display and research facilities. Taxa should be assessed as to their invasive potential and appropriate controls taken to avoid escape and subsequent naturalisation.

• The management of *ex situ* populations must minimise any deleterious effects of *ex situ* management, such as loss of genetic diversity, artificial selection, pathogen transfer and hybridisation, in the interest of maintaining the genetic integrity and viability of such material. Particular attention should be paid to initial sampling techniques, which should be designed to capture as much wild genetic variability as practicable. *Ex situ* practitioners should adhere to, and further develop, any taxon or region-specific record keeping and genetic management guidelines produced by *ex situ* management agencies.

• Those responsible for managing *ex situ* populations and facilities should seek both to increase public awareness, concern and support for biodiversity, and to support the implementation of conservation management, through education, fundraising and professional capacity building programmes, and by supporting direct action *in situ*.

• Where appropriate, data and the results of research derived from *ex situ* collections and *ex situ* methodologies should be made freely available to ongoing in-country management programmes concerned with supporting conservation of *in situ* populations, their habitats, and the ecosystems and landscapes in which they occur .

NB. E*x situ* conservation is defined here, as in the CBD, as "the conservation of components of biological diversity outside their natural habitats". *Ex situ* collections include whole plant or animal collections, zoological parks and botanic gardens, wildlife research facilities, and germplasm collections of wild and domesticated taxa (zygotes, gametes and somatic tissue).

Article about IUCN SSC ... Technical Guidelines on the Management of *Ex Situ* Populations for Conservation, Mike Maunder and Onnie Byers, (2004), *Oryx* 38: 342-346.

Abstract:
The recently revised IUCN technical guidelines on the management of ex situ populations represent an attempt to synthesise current thinking on the strategic application of ex situ conservation for the maximum benefit of both threatened species and habitats. Emphasis is given to the need for in-country conservation initiatives and the need to comply with national and international legal structures.

Keywords
Ex situ conservation, Convention on Biological Diversity, IUCN technical guidelines, species recovery, *in situ* conservation

Introduction
In December 2002, the Species Survival Commission (SSC) approved an update of the IUCN Policy Statement on Captive Breeding (IUCN, 2002). This document reflects an evolution in the strategic application of *ex situ* techniques where emphasis is given to the absolute priority of *in situ* conservation. The definition of *ex situ* conservation follows the Convention on Biological Diversity (CBD), "the conservation of components of biological diversity outside their natural habitats" (Glowka *et al.*, 1994). While acknowledging that debate still proceeds on the effective deployment of *ex situ* management (Ebenhard, 1995; Snyder *et al.*, 1996; Gippoliti and Carpaneto, 1997; Guerrant *et al.*, 2004), these guidelines reflect the importance of the broad portfolio of services that *ex situ* facilities and techniques can provide to support the conservation of wild populations and habitats.

Changing Role of *Ex Situ* Conservation
Ex situ facilities for wild species conservation, encompassing zoos, botanic gardens, aquariums, gene banks and research facilities, represent a massive conservation investment. The effective utilization of this diverse range of facilities and their associated resources will continue to be an important part of any attempt to retain current levels of biological diversity. Since the original IUCN Policy Statement on Captive Breeding (IUCN, 1987) the science and practice of *ex situ* conservation has developed enormously. A number of important changes, including new policy and legal instruments, have profoundly altered the working context and objectives for *ex situ* conservation.

There has been a fundamental shift towards using *ex situ* conservation as a set of techniques supporting the conservation and recovery of wild populations, with the *ex situ* population management undertaken in close collaboration with, and as a support to, the wild stocks (e.g. the model of the Center for Plant Conservation in the USA). There has been an extraordinary development in global experience with *ex situ* techniques, with expanding national and global networks of *ex situ* practitioners that are developing skills in species management and collaborative working with a wide variety of conservation agencies and *in-situ* stakeholders (Westley and Miller, 2003). This can be demonstrated through two examples (a) the extraordinary growth of national and regional botanic garden networks, and (b) the extending influence of the Conservation Breeding Specialist Group regional groups in Latin America, South Africa and Asia. *Ex situ* conservation, and associated display and educational activities, is utilized as a tool to lever political, financial and scientific support for the conservation of important habitat areas and ecosystem services. In addition we have seen major new institutional investments, notable botanical examples include the Millenium Seed Bank, Royal Botanic Gardens, Kew (UK), and conservation biology laboratories at Kings Park and Botanic Garden, Perth (Australia) and Chicago Botanic Garden (USA) providing both new facilities and intellectual investment. The scientific tools for *ex situ* conservation have advanced dramatically, particularly with regard to information systems, collection planning, genetic assessment, gamete and zygote storage, and controlled reproduction. For instance, the Center for Plant Conservation (USA) has developed practical guidelines for the *ex situ* management of threatened plants (Guerrant *et al.*, 2004). The liabilities and risks of *ex situ* conservation have been clearly identified with regard to deleterious modifications to *ex situ* stocks (e.g. Joron and Brakefield, 2003; Husband and Campbell, 2004), the transmission of pathogens, and the risk of invasive species escaping from *ex situ* holdings (Reichard and White, 2001). However we argue that more work is need on the practical management of pathogen risks for *ex situ* collections.

The absolute need for *ex situ* capacity has been repeatedly demonstrated through successful captive breeding and reintroduction projects that have ultimately established new populations, for instance the reintroduction of Californian condor to the Grand Canyon and the reintroduction of Arabian oryx to a

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number of Middle Eastern nations. At the same there is the recognition that some species may not returned to the wild for the foreseeable future, and face long term and probably inter-generational management *ex situ* (Maunder *et al.,*1999). It is also increasingly clear that *ex situ* conservation must be responsive to unexpected challenges. For instance, until very recently the Asian *Gyps* vultures would have been low on any list of captive breeding priorities, now as a result of rapid and catastrophic declines in wild populations (Lindsay *et al.*, 2004) captive breeding may be a vital component in any conservation initiative. In addition *ex situ* expertise has expanded dramatically to encompass those groups of perceived lower display value e.g. mollusks (Mace *et al.*, 1998) and bryophytes (Pence, 2004).

Above all, the legal and political context for *ex situ* conservation has changed profoundly since 1987. A number of strategic documents from *ex situ* networks (e.g. IUDZG/CBSG IUCN/SSC, 1993; and BGCI, 2001) and multilateral environmental agreements now recognize *ex situ* as a valid tool. Amongst the latter, two of the most important are the Convention on Biological Diversity (CBD) and the associated Global Strategy for Plant Conservation. Linked with the changes in legal context is the recognition that not all *ex situ* conservation will take place within the developed world institutions and that in-country *ex situ* conservation will be an increasingly appropriate and cost-effective option for species in high diversity regions (Maunder *et al.*, 2002).

IUCN Technical Guidelines

The IUCN Technical Guidelines on the Management of *Ex situ* Populations for Conservation were drafted by a team established by CBSG, with working groups convened at the 1999 and 2000 CBSG Annual Meetings. This group then worked with a wide range of stakeholders to ensure the document reflected policy in as wide range of *ex situ* practitioners as possible. The botanical liaison was conducted via the Plant Conservation Committee of the SSC. Following extensive review within the larger SSC Network, the final version was adopted. The document was designed to provide the following:

(1) A set of guidelines that establishes the core values and policies for *ex situ* practitioners dealing with any taxonomic group, both within and external to the range country.
(2) To clearly state the increasingly valuable role of *ex situ* conservation within the context of *in situ* conservation, particularly ecosystem and habitat conservation, and the ecological services that can only be provided by *in situ* conservation.
(3) To reflect the increasingly sophisticated role of *ex situ* institutions in directly supporting and funding in-country and *in situ* conservation activities.
(4) To reflect existing strategic and scientific frameworks for *ex situ* conservation, established through international legislation (e.g., CBD and Global Plant Conservation Strategy), the international agencies (International Plant Genetic Resources Institute and the Food and Agriculture Organisation) and *ex situ* networks (e.g. American Zoo and Aquarium Association, Botanic Gardens Conservation International, Conservation Breeding Specialist Group, Center for Plant Conservation).

The Technical Guidelines state "the primary objective of maintaining *ex situ* populations is to help support the conservation of a threatened taxon, its genetic diversity, and its habitat". Key areas of the guidelines encompass the selection of priority species, need for developing *ex situ* protocols, and the need to manage the risk of natural catastrophe, disease or political upheaval on *ex situ* programmes.

The Preamble emphasizes the IUCN goal of "the maintenance of existing genetic diversity and viable populations of all taxa in the wild in order to maintain biological interactions, ecological processes and function", and recognizes the support role of *ex situ* efforts. It is clearly stated that "*ex situ* conservation should be considered as a tool to ensure the survival of the wild population" and "only as an alternative to the imperative of *in situ* management in exceptional circumstances", and "effective integration between *in situ* and *ex situ* approaches should be sought wherever possible".

The technical guidelines request that those responsible for managing *ex situ* plant and animal populations and facilities "use all resources and means at their disposal to maximise the conservation and utilitarian values of these populations, including: 1) increasing public and political awareness and understanding of important conservation issues and the significance of extinction; 2) co-ordinated genetic and demographic population management of the threatened taxa; 3) re-introduction and support to wild populations; 4) habitat restoration and management; 5) long-term gene and biomaterial banking; 6) institutional strengthening and professional capacity building; 7) appropriate benefit sharing; 8) research on biological and ecological questions relevant to *in situ* conservation; and 9) fundraising to support all of the above. *Ex situ* agencies and institutions must follow national and international obligations with regard to access and benefit sharing (as outlined in the CBD) and other legally binding instruments such as CITES, to ensure full collaboration with all range States".

Conclusions

These guidelines reflect a scenario whereby stocks are managed in tandem with wild populations and that the period of *ex situ* intervention is minimized in terms of both time and any deleterious genetic or demographic impacts. These guidelines reflect the increasing investments by *ex situ* institutions in habitat conservation (Cohn, 2000; Stanley Price et al., 2004). Examples include zoo support for

Brazilian Atlantic rainforest using primates as a flagship (Holst, 2003) and the political lobbying by the European Association of Zoos and Aquaria (EAZA) against bush meat trading (Stanley Price *et al.*, 2004). Botanic garden examples include support from the Royal Botanic Gardens, Kew and Missouri Botanical Gardens respectively for *ex situ* facilities and protected areas in Mauritius and Madagascar, and the Utrecht Botanic Garden supporting *in situ* reserves in French Guyana. The recently established African Botanic Garden Network has placed a strong emphasis on habitat conservation, retention of traditional knowledge and the challenge of poverty alleviation as well as a traditional focus on conserving threatened or endemic species (Anon., 2004).

The effective utilization of *ex situ* facilities and their associated resources as a support to the conservation of wild populations and habitats will be an important part of any attempt to retain current levels of biological diversity. The IUCN Technical Guidelines on the Management of *Ex Situ* Populations for Conservation will, we hope, help to strengthen the beneficial impacts of *ex situ* facilities, reduce some of the inherent problems of *ex situ* management, and increase acceptance of *ex situ* efforts as an integral component of biodiversity conservation.

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Biographical Sketches

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Internal communication and its magical effect

R. Hemanth Kumar*

Introduction:
Communication is a critical determinant of individual, team, and organizational performance. It helps in the exchange of information and in knowledge exchange and creation. Communication enables us to establish knowledge management units which help by creating an atmosphere where the members of the group will in good, positive communication.

Internal and external communication frequencies are linked to team performance. Open communication helps us in creating an environment with mutual trust which will further help staff to willingly engage themselves in desirable organizational behaviours. Many believe that social interactions facilitate resource exchanges among employees and business units which can lead to the generation of new ideas and enhanced organizational performances.

In the view of the above, in Kanpur Zoo we have undertaken a small experiment involving all tiers of the organization and have experienced the magical effect of internal communication. The experiment and results are narrated below:

Pheasantary in Kanpur zoo - glorious past
In the past the Kanpur zoo bred pheasants very successfully noted in statistics below.

1995-96: 16 pheasants, 1996-97: 20 pheasants, 1997-98: 25 pheasants, 1998-99: 29 pheasants, 2002-03: 8 pheasants, 2003-04: 4 pheasants, and in 2005-06: 6 pheasants were born in Kanpur Zoo.

The indefatigable role of Kanpur Zoo in breeding different kinds of pheasants is evident from the following Table wherein its breeding record is compared with some selected zoos of India.

Problem identified
After looking at our glorious past in successfully breeding various pheasants in Kanpur zoological park, it was decided to study why now we were unable to breed the pheasants like in past.

For it a team of people was selected. While selecting the team care was taken that all members had sufficient knowledge of handling of birds. The team consisted of the author, Zoo Vet Dr. U.C. Srivatsava, Shri Ayodya Prasad, Forest Ranger, Shri Rampal, Wildlife Guard, Shri Jhagru, keeper of the aviary (State award winning keeper), Shri. Vinod, Sweeper (another State awardee).

After a series of in-house discussions we concluded:
- Rat populations in enclosures of Aviary damaging pheasants
- Live insect food (crucial to nutrition) lacking
- Insufficient privacy
- Insufficient calcium in grit esp. during spring
- Insufficient facilities for sand bathing/ mud bathing
- Dosage of deworming medicine insufficient due to current practice of mixing it in water

Selected Pheasants in Selected Zoos: 1995-96 to 2004-05

Zoo	KZP		LZP		NZP, Delhi		NZP, HYD		Darjeeling	
	Total Birth	Total Death	Total Birth	Total Death	Total Birth	Total Death	Total Birth	Total Death	Total Birth	Total Death
IKP	32	7			9	5	0	2	5	8
LAP	17	13	0	3	0	2	0	1	48	19
NKP	4	1	0	0	0	0	0	0	0	0
RNP	2	6	0	0	1	0	0	3	0	1
SP	52	34	1	3	29	8	11	1	21	12
Phea										
Reev	0	2	0	2	0	0	0	0	0	4
Golden	2	2	1	0	0	2	0	2	9	1
Green	0	0	7	6	2	1	0	0	0	1
Monal					0	0	0	0	0	1
Copper	0	0	0	0	0	0	0	0	0	4
Grey pc	0	0	0	0	0	0	0	0	8	5
Edward	0	0	0	0	0	2	0	0	0	0
Total	**109**	**65**	**9**	**14**	**41**	**20**	**11**	**09**	**91**	**56**

Key
KZP: Kanpur Zoo
NZP-HYD: Nehru Zoo
PNZP: Darjeeling
LZP: Lucknow Zoo
NZP: Delhi

IKP: Indian Kaleej
LAP: Lady Amherst
NKP: Nepalese
RNP: Ring Necked
SP: Silver Pheasant

Source: www.cza.nic.in

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Once the problems were identified another team of volunteers was formed, consisting of Mr. Vinod, Sweeper, Mr. Tara, Masson, and Mr. Rampal Wildlife Guard for implementing the decisions taken by the team. Before exactly starting our work, the course of action was discussed with Mr. Rajat Bhargav of Meerut, an expert on Birds.

Measures adopted

1. Controlling Rats - The problem

It is important to keep vermin out of the aviary. A thriving rat and mouse colony in the aviary will double the food bill, foul the food which they don't eat, spread diseases, disturb the nesting birds, may even eat the eggs and the young ones.

With the current weekly practice of draining the floor and killing the rats by physical means we were able to control the vermin temporarily, but the muddy floor looked dirty creating a wrong impression. It was decided to look for a better, cheaper and more viable solution keeping in view of meager financial resources available with us.

Some of the measures discussed

Most of these pests gain access into aviaries at the ground level or below. There are several method to prevent them such as:

• a time - honoured way of discouraging them is to dig a trench about a foot deep all around the base of the enclosure and fill this with cement or bricks to just above the ground level, building the aviary on this foundation

• or, to bury the wire netting of the sides of the flight cage, right down into the trench turning it outwards at the bottom and then fill in the trench with earth,

• or to lay concrete for the entire floor

• or covering the entire floor with wire-netting

All of these proved to be very costly and we did not have budget to cover the costs.

So we decided to go for following cheaper and most viable alternative which was to dig up the earth to 3 foot, then cover over floor with rubble including pieces of broken glass. Over that, a layer of bricks were laid with their edges cemented. Above this brick layer, considering the clayey nature of the soil, sand was added to soil at a ratio of 40:60, so that the earth would not get compacted and hence rats won't get an opportunity for burrowing.

Costs: The Zoo spent an amount of Rs. 34,194 on 12 enclosures of the total carpet area of 195.36 sq. mts., which was a pittance compared to the costs involved for adopting any of the other measures.

The next nearest cheapest solution would have cost the zoo about Rs. 6,00,000.

2. Live Insect Food

Even though most of the birds are seed eaters and live for many years without insect food, their health is benefited and their plumage will greatly be improved with addition of live insects into their food especially during breeding season. To provide insects, logs infested with termites were arranged in the enclosures by the staff, which gave a naturalistic look to the enclosure in addition to providing live insect food to the pheasants. Another measure adopted was unloading termite infested earth, gunny bags, etc in the enclosures.

Costs: No Cost to the Zoo

3. Grit

Grit is essential for seed eating birds. Because the birds don't have teeth for grinding the seeds, they have to swallow their food in whole or in lumps broken up by their beaks. Hard corn, seeds and nuts need breaking up before they can be properly digested so the bird swallows grit and stores it in gizzard. Seeds having been softened by the juices of crop, passes into the gizzard where its muscular action grinds them up with the grit.

In Kanpur zoo, we started using more of crushed oyster shell, cuttle-fish bone, and limestone with grit, as these are capable of being dissolved in the bird's digestive processes and absorbs into the system. They are a valuable source of lime needed for bone and feather formation especially at the breeding season when eggs are being formed and young have to be fed. Cuttle-bones are fixed in the wire mesh and birds will nibble them when they please

Costs: Only a few hundred rupees.

4. Bathing

Bathing is essential to good feather condition and without it plumage lacks that gloss and finish, a hallmark for well-kept birds. Bathing induces preening and this in turn keeps the feathers in good condition. So, we provided dust baths for our pheasants in dry spots, like corners of the shelter, which gets sun, as they like to dust-bathe in a patch of sunshine. A mixture of sand, ashes, and dry soil makes a good dust bath.

Costs: None

5. Privacy

Pheasants are pugnacious birds, especially the cocks in spring. Hence there must be some form of screening along the wire partitions, or there will be a constant fighting through the netting. Therefore for controlling fighting we purchased *Sirki* (a kind of mat) from the market, colored them with three different colours (in order to give good look) and fixed them along the wire partitions

Costs : Rs. 1,320 for 12 enclosures

Each piece of screening material (3 ft x 4 ft) cost Rs. 15; 7 pieces were used per enclosure at a cost of Rs. 105 plus Rs. 5 for wire binding.

Pheasants require a little shelter; a few bushes look nice and give daytime shelter. Shelters were prepared by using the locally available materials by our staff. A positive sign is that for the first time Golden and Kaleej Pheasants became broody even in the zoo setting.
Costs: None to the zoo

In the Red Jungle Fowl Aviary, Mr. Vinod constructed a three-tired mud structure. This structure has 10 partitions and the birds started using them for brooding their eggs. By now 9 chicks of Red Jungle Fowl were brooded here for the first time. Otherwise we were dependent on country fowls for brooding Red Jungle Fowls.

6. Control of deaths due to parasitic infections, shock etc.
In the past in Kanpur zoo deaths among pheasants were due to problems related to egg-binding (when hens are unable to pass the egg. It is associated with soft-shelled eggs), parasitic infections, shock etc. In order to minimize the death rate from the above mentioned problems we started adding more of cuttle-bone, ground oyster shells etc and giving deworming medicine regularly. Deaths due to shock do not occur now as the enclosures are now fully free from rats etc.
Costs involved: None to the zoo

7. Results
The whole-hearted efforts resulted in the birth of 11 Silver Pheasants, 2 Golden Pheasants, 17 Ring Necked Pheasants, and 5 Kaleej Pheasants. Among these, the lone pair of Ring Necked Pheasants after a gap of 13 years blessed us by giving us fertilized eggs from which 17 chicks were hatched; similarly ever-elusive Golden pheasants greeted our efforts by giving a hatching of two chicks. The lone pair of Indian Kaleej pheasant made us proud by helping us to breed this endangered species in the zoo.

The results are even more gratifying considering the fact that we could achieve them from a mere pair each of Indian Kaleej Pheasants, Golden Pheasants and that of Ring Necked Pheasants, and from 2 pairs of Silver Pheasants. From these a total of 35 different pheasants were born.

8. After care
It is very much essential to look after the chicks so that mortality rate among them will be a bare minimum. For this, a team of dedicated staff was constituted for helping Veterinary Doctor U.C. Srivatsava. The team comprised of Mr. Vinod, Mr. Masicharan, Mr. Pratap, Mr. U.S. Dwiwedi, Mr. Sahab Lal and Mr. Rampal, due to their constant vigil and due care all of our chicks are hale and healthy.

9. Cost-Benefit Analysis
From a situation where the zoo once brooded about 20+ pheasants every year, then came a situation where the numbers dwindled down to 2-3 per year to a situation which challenged us to get back to the past success. This effort culminated in the Zoo breaking all of its own past records and the National records also.

Cost:

• On making the enclosures rat proof	Rs. 34194
• On providing Privacy	Rs. 1320
• On providing live insect food	Rs. None
• On providing Calcium to grit	Rs. 500
• On providing sand baths	Rs. None
• On measures for control of deaths	Rs. None
• On broody hens	Rs. 2100
• On vaccination, minerals, vitamins etc. to the chicks	Rs. 500
• Other misc. expenses	Rs. 2286
Total amount spent	**Rs. 40,000**

Benefits: With these works the zoo is able to benefit:

(A) Tangible benefits
The value of the tangible benefits: **Infinite**

(B) Intangible benefits
• State and National recognition to the zoo for its efforts
• an opportunity for the zoo management open its internal communication channels with the lower staff
• a sense of great satisfaction amongst the whole staff
• active involvement of the staff
• helped us to increase innovation skills
• the support process helped the Director to make better decisions
• this treasure of acquired knowledge will help us in increasing pheasant numbers next year
• Now the staff is approaching the zoo management voluntarily for doing something helpful for their animals. With their active association we are going to take up other groups of animals like Swamp Deer, Manipuri Deer etc in near future.
Thus the Cost basis ratio is 1: infinite

Challenging, interesting, vibrant, fulfilling . . . my three years in Kanpur Zoo

R. Hemanth Kumar*

When I got my posting orders in March 2005 as Director, Kanpur Zoological Park, I had mixed feelings, as I had been briefed by friends that the Kanpur zoo was plagued with many problems like lack of funds, irresponsible staff, court cases, etc. At the same time I was happy to get the posting, as I am getting an opportunity to work at a place that does conservation breeding of endangered Indian Wildlife, and offers an attraction educates and entertains a half-million people a year. It was an opportunity to work where the entire staff stays busy and there is always something new going on.

As time went on, I found that my co-workers were highly talented, but were working in an environment that did not provide any motivation for them. Another opportunity, although a great challenge was to live up to the vision of Kanpur Zoo, that is to successfully breed endangered Indian wildlife. I felt that instilling a sense of belonging, enthusiasm and self-realization in my co-workers to propagate imperiled Indian wildlife would not be a difficult task.

The measures which I adopted brought in splendid results, which made my job ever challenging, interesting, vibrant and fulfilling.

I. Motivating the staff

The answer for a number of niggling problems in institutions is to put in place an effective two-way communication process. A communication process helps staff understand that their views are respected, and that they are valued. It brings a sense of belonging among staff and they begin to feel that they are very much needed by the institution. Thus I am a firm believer that communication is a critical determinant of individual, team, and organizational performance. In turn this helps in the exchange of information and further, knowledge exchange and knowledge creation. Communication helps establish the knowledge management units which, helps in creating an atmosphere of positive "vibes" for group members. where the members of the group will be with positive vibes.

The internal and external communication frequencies are linked to team performance. Open communication helps in creating an environment with mutual trust which will further staff willingly engage themselves in positive and productive organizational behaviours. Many believe that social interactions facilitate resource exchanges among employees which can lead to the generation of new ideas and enhanced organizational performances.

• **Further, my experience has indicated that:** The development, management, and transfer of knowledge **are critical for the success of the zoo**
• Knowledge management goes beyond the generation and acquisition of knowledge as such; it also includes the **management and sharing of information**
• The success to knowledge management is communication

• In the zoo setting, knowledge management has many potentially important implications, such as:
- It is critical for ensuring that employees have **the most current knowledge and skills** in animal care and management
- A focus on knowledge-sharing will ensure that advances in animal care and management practices generated in one part of the zoo are transferred to otherparts.

• **Managing institutional knowledge can also prevent the loss of knowledge** that typically occurs when individuals leave an organization, and thereby ensure that animal care and safety are not compromised by staff turnover

• Knowledge is essential **for providing high-quality animal care** and **management**
• For achieving it, the following measures were adopted:

- That we have a defined and specific method for achieving our mission
- That there **is a platform wherein people can express their ideas** whether pioneering, stupid, stereoscopic, or stereotypic)
- That the zoo management promotes full expression of ideas, feelings, worries, etc. by employees (an example for such an initiate is "Hamaare yaaden")
- That we have an **in-house Zoo Advisory committee (a two-way communication channel)** comprising people from all levels, including sweepers, keepers, gardeners, etc. apart from officials. The committee meets once in a month and discusses the following issues
  - Animal Care
  - Sanitation in the zoo
  - Security issues
  - Educating the zoo guests
  - Positive, polite attitude towards the guests

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• The staff are exposed to the concepts like Kaizen and CAN DO—A STEP TOWARDS TQM?
• We celebrate the successes together and create challenges from the failures
• Active involvement of the staff is assertained by the following

  • Set up a short-life working group to review how well the Zoo can communicate well internally and externally
  • Turn the group's findings into a simple action plan, which are implemented over the course of a year
  • By developing the concept of 'communication champions' asking team members to act as a champion for each area of communication activity
  • Share knowledge and learning
  • Celebrate success, Communicate every success

This entire process helped in diverting staff attention towards fulfilling their self-actualization needs, e.g., developing pride and recognition in as a result of their work. This culminated in splendid results and, in addition, reduced court cases, minimized wastage, and generated spectacular results in breeding animals in the zoo.

II. Breeding successes

Kanpur Zoo, set in a spectacular sylvan setting , once was famous for successfully breeding both Indian and exotic wildlife. These included Orangu-tans, Chimps, Red Pandas, Hippos, Zebras, Emus, Lions, Rhinos, Tigers, Pheasants, a variety of deer, and Himalayan black bears. Despite past successes, there has been a lull of late in breeding of animals in the zoo.

Why the scientific breeding of animals is needed?

The ever-increasing human population is impacting our natural ecosystems for food, farmland, fresh water, and firewood, and for raw materials. When habitats come under threat, it is invariably the wildlife that goes first because their demands upon natural environment are the greatest (other than that of human beings).

Thus, the importance of zoos, for zoos, working together, can preserve genetic diversity in small populations of wild animals with systematic, scientific captive management, all the while in hopes that the source of the problem, habitat destruction or over-exploitation of natural resources can be rectified.

Zoos can maintain a reservoir of diverse genes for species in peril. Breeding animals scientifically—removing inbreeding, and establishing management protocols resulting in genetically diverse and healthy zoo animals is the quintessence of zoo management.

Curiously, populations often can survive even if they all derive from a very small number of founding parents but after some time they lose fitness leading to a low conception and birth rate, low survival rate of neonates leading to decline in numbers and ultimately extinction. This phenomenon is directly related scientific management of zoo animal populations with good breeding records and infusion of new genes in to the population.

This was recognized by the Central Zoo Authority (CZA) in their *"Concept paper on In-situ ex-situ linkage - Conservation Breeding of Endangered Wild Animal Species in India".* A relevant portion of it reads "it was felt that Indian Zoos have to have at least 100 properly and scientifically bred and physically, genetically and behaviorally healthy individuals of each endangered wild animal species in captivity to act as insurance cover in case of population loss of the species in the wild. Three objectives i.e. having proper captive stocks to continue display, have properly bred animals to act as insurance and for reintroduction or release in the wild in case needed, form very base of planned coordinated conservation breeding programme in Indian Zoos".

In this context, I was fortunate to be welcomed by a pair of newly born Himalayan Black Bears and by 8 Emus, when I joined the zoo as Director in March 2005 and later a number of important animals were born in the Zoo such as Indian Rhino, Swamp Deer, Chousingha, Brow-antlered deer, Pheasants, Red-Jungle Fowls, etc. In the last three years the number of endangered animals went up 77 individuals. Comparative figures are given below:

S.No	Year	Scheduled and Non-Scheduled Animals		Total
1	2004-05	190	424	614
2	2005-06	214	810	1024
3	2006-07	270	880	1150
4	2007-08	267	953	1220
	(Upto Dec 2007)			

Some of the spectacular results which show the important role played by Kanpur zoo in breeding of animals are shown in Tables found on the website of Central Zoo Authority. For example the Swamp Deer (Barasingha) *Cervus duvauceli* in Indian Zoos, Source of date is www.cza.nic.in. Births of swamp deer in Kanpur Zoo have been steady since 1997 and in my tenure I could experience the satisfaction of seeing 15 more animals born. Also Red Jungle Fowl, Silver Pheasant, Manipur Brow-antlered deer, Himalayan Black Bear and Kalij Pheasant. See box on next page.

Statistics indicate the important role played by Kanpur zoo in breeding wild animals on its premises. It high on the list among the other related institutions in its endeavor. Kanpur Zoo feels special as it was chosen up by CZA in its

Some Outstanding birth records in Kanpur Zoo - 2003-05
Source: www.cza.nic.in for species Tables

I *Cervus duvauceli* -- Swamp Deer (Barasingha) in Kanpur Zoo
Births of swamp deer in Kanpur Zoo from 95-96 to 04-05 = 20; from 2005-08 = 15

II *Gallus gallus* -- Red Jungle Fowl in Kanpur Zoo
Births of Red Jungle fowls in Kanpur zoo from 2003-05 =4; from 2005-08 = 42

III. *Phasianus colchinus* -- Ring Necked Pheasant in Kanpur Zoo
Births from in Kanpur Zoo 1995-to 04-05 = 2; from 2005-08 = 19

IV. *Lophura nycthemera* -- Silver Pheasant in in Kanpur Zoo
Births in Kanpur zoo during 2007-08 are 13; from 2005-08 = 18

V. *Cervus eldi* eldi -- Deer Brow-antlered - Sangai in Kanpur Zoo
Births in Kanpur zoo from 04-05 to 04-05 =10; 2005-08 = 7

VI. *Selenarctos thibetanus*-- Himalayan Black Bear in Indian zoos
1 Births each zoo - Alipore; Nehru ; Biol pk, AP; Jaipur; IG, Vizag; Banerghatta
2 Births each zoo- Lucknow; Rohta; Maitribaag; Natl; Gandhi; Kamala Nehru; Arignar Anna; Renuka
3 Births each zoo - Bhivani; Nandankannan; Mysore; Chatbir Zoo; Himalayan NP Kufri
4 Births each zoo - Bhagwan Birsa Munda Zoo, Jharkhand
5 Births zoo - Sepahijala zoo
6 Births zoo - Kanpur Zoo

VII. *Lophura leucomelanos* — Kalij Pheasant in Kanpur Zoo
Births of Kalij Pheasants 94-95 to 04-05= 32; 2003-05 = 8

ambitious programme which aims at linking *in-situ* and *ex-situ* conservation measures, especially for the taxa like Swamp Deer and Rhino.

In addition, during the last three years, revenue went up from Rs. 42,77,677.00 in 2003-04 to Rs. 53,43,764.00 in 2006-07 and in this year also, it is expected to be near Rs. 54,00,000.00, an increase of Rs. 11,22,323.00. In the corresponding period the number of visitors to the zoo also has gone up by about 87,000.

All this could be achieved only because of our dedicated, motivated co-workers who are ever ready for showing continuous improvement.

My experience with my co-workers proved that beyond a certain point money doesn't mean as much as personal satisfaction, and a sense of being needed and wanted. Similarly communication with our staff helped us to resolve issues of polarity, reducing figures and projections, which ultimately helped us to achieve our goals. Meaningful communication helped us in the skill of "Losing one's mind and coming to one's senses" and in nullifying "skilled incompetence" of the peers. Active involvement of the staff could be accomplished by making them feel that they are very much needed in the system through meaningful communication.

Thus my last three years in the zoo as Director have been *challenging, interesting, vibrant and fulfilling.*

Red jungle fowls hatched on 26 January 2008 in Kanpur Zoo, Kanpur

Loss of biodiversity in the face of global warming

Thilina Surasinghe*

Introduction

Solar energy serves as the primary energy source for almost all the ecosystems of the world and drives primary production. Solar radiation is the heat source for the earth and fuels the optimum ecosystem functions. Incoming IR radiation is retained within the atmosphere by heat trapping gases such as carbon dioxide exerting the natural greenhouse effect (Rogers, 1990). Atmospheric carbon dioxide is essential for organic evolution and sustenance of all the biomes. Had it not being for carbon dioxide, the average global temperature would be -18ºC (Abrahamson, 1989). With technical revolution, several natural and synthetic gases such as carbon dioxide, methane, nitrogen oxides and halocarbons have accumulated in the atmosphere casing enhanced greenhouse effect increasing the global average temperature. Increased temperature causes significant atmospheric alterations leading to climate change (Cox *et al*., 2000). The major reason behind the global warming is increased combustion of fossil fuels for energy. Certain industries also emit greenhouse gases. Further, destruction of the carbon sinks such natural forests, adverse agricultural practices such as intensive monoculturing that damage the carbon and methane storage capacity of soil aggravate the situation (Chen *et al*., 2001). Intensification of global warming is reflected by the fact that the 10 warmest years of the 19th, 20th and 21st centuries being recorded within the last decade: 1998, 2005, 2003, 2002, 2004, 2006, 2007, 2001, 1997, 2008. During this period, global sea surface temperature has risen by 0.4-0.8ºC and it is predicted that this value will creep up to 1.4-5.8ºC at the turn of the 21st century if no proper measures are taken to limit the emissions of greenhouse gases (IPCC, 2008).

Impacts on natural vegetation

The wet tropical montane ecosystems and temperate ecosystems such as taigas, boreal forests and tundras are the most vulnerable to global warming and related impacts. The extent of these biomes is shrinking significantly with global warming such as, rainforests of north east Amazon that are being degraded. Generally, vegetation shifts poleward with warming climates but montane and polar habitats do not have a physical space to shift (Leemans and Eickhout, 2004). With warming climates, diversity rich habitats will get replaced by less diverse habitats, where rainforests will be converted to grasslands or deserts (Emanuel, 1985). Global warming imposes a physiological stress on vegetation that reduces net primary production and enhances the heterotrophic respiration ultimately leading to growth retardation and reduction in net ecosystem productivity (Saxe *et al*., 2000). Further with increased atmospheric temperature, natural vegetation is highly susceptible for pest and pathogenic infestations. This can be attributed to subjugation of plants' innate defenses against pathogens and increased environmental favorability for pests and pathogens. For example, under higher-than-average Mediterranean temperatures, the Oak fungus causes severe root rotting (Harvell *et al*., 2002). Further, during 1992-93, three successive unusually warm summers invoked the worst infestation of bark beetles devastating thousands of hectares of Australian and German forests.

High temperature allows thermophilic exotic flora to achieve a competitive advantage over native flora. Certain invasive plants demonstrate increased seed production and seed viability ensuring their propagation. For example, in Florida, introduced eucalyptus species have invaded the swamplands and formed dense monotypic stands hindering the growth of native vegetation.

Impacts on terrestrial fauna

Terrestrial fauna may feel multiple impacts upon global warming including changes in phenology, distribution and physiology, even extinctions. Temperature, rainfall and humidity may become unfavorable, rendering certain habitats hostile. Moreover, environmental severity reduces growth, impairs reproductive success, foraging abilities and immunity (Parmesan *et al*., 1999).

Amphibians, being specialized for narrow thermal regimes, are imperiled by global warming with reduced humidity and precipitation predisposing them for dehydration and reduction in egg and juvenile survival. Through habitat modification, global warming renders certain habitats unsuitable for amphibians, such as early drainage in ephemeral ponds and vegetation dieback. Similarly, in Africa, Silver dik-dik, Grey-cheeked Mangabey and Sahara Oryx are losing the majority of their habitats with global warming (Thuiller *et al*., 2006). Once preferred habitats shrink, wildlife experiences resource scarcity and range restrictions. Species with restricted distribution encounter grievous conditions with global warming (Dunbar, 1998). For example, lower altitudinal limit of the Gelada Baboon rises by 500m for every 2ºC rise in temperature shrinking its range towards the northern parts of the Ethiopian Plateau where their original distribution will be halved. Global warming can result decreased thickness of natural forests causing increased

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predation by invasive species. This was evident in the Easter Island where Pacific Rats voraciously fed on native birds (Hunt, 2007).

Migratory birds confront problems with global warming due to phenological disruptions, low food availability on migratory routes and destinations (Green and Pickering, 2002). Marked shifts in temperature are cues for migration. Success in migration depends on food availability and environmental conditions at the overwintering site. Upon arriving at destination or refuges, birds predate on invertebrates that emerge synchronizing birds' arrival, to replenish energy. The effect of global warming results an asynchrony between advent of birds and emergence of invertebrates, where the birds decimate with starvation. Further, sea level rise and inundation of coastal wetlands reduce availability of habitats of migratory birds (Austin and Rehfisch, 2004).

In face of global warming, volant species show poleward shifts in their ranges. For example; among 35 non-migratory European butterfly species, 63% have shifted their range to the north-pole by 35-240km during the 20th century (Parmesan *et al*., 1999). For biologically viable poleward shifts, the entire community needs to move simultaneously, which mostly does not happen. For instance, the critically endangered Kirtland Warbler of the USA nests in sandy soils of Michigan's Jack pine forests. With warming trends, they retreat into far north of Canada, where undrained soil disfavors nesting and young rearing (Arau jo *et al*., 2005).

Global warming alters climate oriented phenomena that govern ecosystem structure and function. For instance, in Australia, retarded pyric events decreased the extent of open forests and woodlands markedly reducing the faunal diversity (Asner *et al*., 1997). High temperature reduces occurrence of cloud-born mist which yields a unique environment for amphibians. Sex determination of herpetofauna is governed by temperature not by genes.

Hence, high temperature causes highly skewed sex ratios decreasing reproductive success (Lance et al., 2000). With global warming, parasitic infections become more virulent and spread faster. Most tropical pathogens prefer high temperature. In warm climates, distribution, pathogenesis and reproductive success of pathogens and their vectors get improved substantially (Bengis *et al*., 2003). Extreme heat imposes physiological stress which greatly weakens host's immunity increasing the host's vulnerability. Strongylid lungworms of Musk Oxen developed rapidly under slightly higher summer temperatures (Dobson *et al*., 2003).

Impacts on aquatic fauna including marine and coastal ecosystems

Most prominent threat over coastal ecosystems comes up with the rise of sea level, due to thermal expansion of sea water. Rising sea levels inundates and intrudes into coastal and brackish water habitats casing habitat loss for many species either as a direct result of floods or due to increased salinity (IPCC, 2008). Rising temperature causes rapid melting of oceanic icebergs and ice sheets inhabited by polar fauna. Microbial primary producers grow on sea-ice. With rapid melting, microorganisms will disappear causing food shortage. Reduced sea-ice area has proven to shorten hunting duration for polar bears significantly reducing their weight. Further, reduced sea-ice cover has lead to population crashes in the Arctic fox marine carnivores (Lawrence and Soame, 2004). The main impact of global warming on inland wetlands is drying out and reduction of water levels with increased evaporation and water temperature being inhospitable, potentially exceeding physiological tolerance. Besides, high temperature could deplete the dissolved oxygen levels well below biologically favorable limits (Rehfisch *et al*., 2004).

Rising of sea surface temperature alters patterns of sea water circulation that governs nutrient distribution and physio-chemical properties of oceans. This will affect the distribution of marine species as in response to modifications of resource availability. For instance, in California, climate-ocean regime shift in 1976-77 resulted in reduced nutrient supply, decreasing productivity and causing reduction in sea bird abundance (IPCC, 2008).

Coral bleaching is another profound effect of global warming. Coral reefs require tropical sea temperature (18^{o}C) and nutrient supply for wellbeing. Even a 1-2^{o}C increment in the seawater temperature can destroy the algae and expulse it form corals, where reefs lose coloration and become white. Secondarily, hydrozoans of the colony may face nutrition deficiencies and become unable to maintain the calcium carbonate skeleton. Coral bleaching can be aggravated by pathogens that become highly virulent in warmer temperatures (Kumaraguru and Ramakritian, 2003).

With the recognition of the threats over biodiversity convoked by the global warming, it is essential take immediate actions to prevent this global catastrophe. Upon identification of increased emission of carbon dioxide as the major causative, it is important to reduce emissions and to preserve the natural mechanisms of carbon removal. This should include minimizing use of fossil fuels, seeking alternative eco-friendly

energy sources and protection of wetlands and forests as natural carbon sinks. Saving the planet from global warming is a responsibility of all the nations.

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Some Short Notes on various species

Hydatidosis in a Jaguar (*Panthera onca*)

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A report on hydatidosis in wild animal is rare. The present paper reports a case of hydatidosis in a Jaguar. An 18 year old Jaguar kept at Arignar Anna Zoological Park, Chennai, died after showing signs of illness for about 15 days. Postmortem examination revealed emaciation with 2 liters of straw-coloured fluid in the abdominal cavity and 250ml in the thoracic cavity. The lung showed tennis ball size cysts, two each on the diaphragmatic lobes, and one each on the apical lobes. The liver was occupied with big and small hydatid cysts, which contained lots of watery fluid and daughter cysts. The adjacent praenchyma was atrophied. Spleen had a few infracts; kidneys were congested; heart showed diffuse petchiae haemorrhage over the epicardium. The stomach showed mucosal erosions and the intestinal blood vessels were engorged. Blood smear did not reveal any infection. Cysts recovered from the lungs and liver were examined to identify the parasite. The cyst contained a large amount of fluid and protoscolices that showed vigorous movement of sucker and rostellum. The metacestode stage was identified to be hydatid cyst due to *Echinococcus granulosus*.

Death was confirmed to be due to cysts. Hydatidosis in animals and man is an important zoonotic disease. In the host, the adult worm does not cause so much distress, but the metacestode stage of the parasite in intermediate host is responsible for dysfunction of vital organs due to pressure atrophy. The cyst causes interference with the function of the affected organs and the danger of fatality in certain cases (Bhattacharya *et al*., 2000).

Echinococcus granulosus is primarily in domestic cycle involving dog as the host and livestock as intermediate host (Verma *et al*., 1998). Hydatidosis has been reported in wild herbivores such as American bison (Choudhary *et al*., 1987). There are records of occurrence of hydatid cyst in the liver of lions of old Madras zoo (Ramanujachari and Alwar. 1954) and Maharajbagh zoo (Ganorkar *et al*., 1997 and Dhoot, and Upadhye, 2002). *Echinococcus granulosus* worms associated with marked catarrhal enteritis were recovered from both small and large intestine of an Indian wolf (*Canis lupus*) during necropsy at Nandankanan Zoo (Rao *et al*., 1973).

In the present situation, the Jaguar, which died after illness of about 15 days and necropsy, revealed destruction of liver tissue and lung parenchyma due to large number of hydatid cyst of varying sizes and leads to dysfunction of the liver and lung, however the exact causes of acquiring the infection of *Echinococcus granulosus* by the jaguar are obscure.

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Necropsy of a porcupine (*Hystrix indica*) which had met with an accident: A case study

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A carcass of female porcupine (*Hystrix indica*) which had met with a vehiculur accident was presented by the Forest Department, Parbhani Territory (Maharashtra) to the Department of Veterinary Pathology, College of Veterinary and Animal Sciences, MAFSU, Parbhani for necropsy (Fig. 1[*]). Gross external examination revealed bruising wound on the back and right lateral aspect of thoracic region showing swelling and cyanotic discoloration of the skin. Quills from the wounded area were found to be lost and broken as well as

few had penetrated into the skin. After opening the carcass, the region below the wounded skin showed severe haemorrhages and blood clots with severe congestion of thoracic and abdominal organs. Lungs showed emphysema, congestion and severe haemorrhages. There were petechial haemorrhages on heart along with engorged coronary vessels. Stomach was found to be full with thick semisolid green ingesta. Spleen showed congestion and haemorrhages. Liver was found to be severely haemorrhagic and congested. Right kidney showed diffuse petechial and focal ecchymotic haemorrhages. Urinary bladder was distended with urine.

Literature on the histopathological examination of organ systems of porcupines is found to be very scanty. However in the present necropsy the histopathological examination of the organs collected viz. liver, kidneys, lung, spleen and heart showed severe haemorrhages and congestion (Fig. 2, 3, 4*). The animal had met with an accident and taking into consideration the gross and histopathological examination, the cause of death of animal appears to be hypovolemic shock resulted from severe haemorrhages.

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(*See Web supplement for images at www.zoosprint.org)

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Case Report: Oesophageal Obstruction in a Captive Himalayan Palm Civet (*Paguma larvata*) at Padmaja Naidu Himalayan Zoological Park, Darjeeling

Deepak Sharma*

Obstruction of oesophagus occurs in all animals (O' Connor, 1980). Oesophagus or gullet is a musculomembraneous tube connecting the pharyngeal cavity to the stomach which conveys the food and drink down to the stomach from the mouth. It can be divided into cervical, thoracic and a very small abdominal part. Owing to its deep position the oesophagus is not visible in outline except when it is distended by a bolus or an obstruction, or by dilatation of its lumen, and all this normally occurs in the cervical region only. Any swelling of the tube in this part of its course can be felt by manipulation in the jugular furrow. The causes of the obstruction may be (i) large size of the obstructing body (ii) sharp projections in the obstructing material which get fixed in the oesophageal wall (iii) stricture of the oesophagus or the spasm of its muscle, (iv) a tumour or growth inside the oesophageal lumen (v) extraluminal mass pressing the oesophagus.

Case Report

On 18-7-2007 morning the keeper on general observation reported that the animal Himalayan Palm Civet (House Name: Nandu Age: 13 years; Male) was not well. Upon physical examination after manual restraint the following clinical signs observed:

1. Restlessness with an anxious look
2. Swelling in the ventral region of the neck
3. Anorexia
4. Dysphagia
5. Attempts to regurgitate
6. Arching of the neck

After clinical examination the animal was immediately taken to the inpatient ward in the hospital for further examination which revealed an obstruction on palpation. Further when an X-ray (A-P lateral view using 48 KV for 1 second at 90cm FFD) of the neck region was done it revealed a round distension in the cervical region of the oesophagus.

Treatment: Prior to tranquilization the animal was weighed and found to be 9 kg. The dosage of Ketamine and Xylazine used were 5mg/kgwt and 1mg/kgwt respectively (Ketamine: Xylazine - 0.45ml : 0.09ml). Manual removal of the obstruction was not possible thus surgical intervention was conducted.

The oesophagus was surgically exposed to remove the obstructed mass. The operation was conducted placing the animal in dorsal position under the influence of general anesthesia with a combination of Ketamine and Xylazine (0.45 ml: 0.09ml). A longitudinal incision was made on the cervical area through the skin and subcutaneous tissue sufficiently long and over the site of obstruction to permit easy extraction of the obstruction. The incised wound edges were swabbed with Neosporin powder (Neomycin, Polymixin B - Sulphates and Bacitracin Zinc powder) and the obstructing mass was removed. The mass was a mixture of fur and the remnants of food particles and approximately it was 8cm diameter ball. To close the oesophageal incision, two rows of sutures were given, the first layer internally was sutured with chromic catgut no. 2-0 using cushing sutures. The outer skin-layer was sutured with Vicryl 2-0 using simple interrupted sutures. While closing the outer skin layer, inclusion of surrounding

fascia was done into the suture bites to strengthen the suture lines.

The medicines used during the surgical procedure along with intravenous fluid therapy were:
1. Injection Dextrose 5% (Claris Lifesciences Ltd)- 450 ml, intravenously
2. Injection Ceftriaxone - 500mg (Cefstan:Ranbaxy) - 1 vial intramuscularly
3. Injection Dexona - vet (Zydus Animal Health Ltd. Each ml contains Dexamethasone Sodium Phosphate- 4.4mg) - 1ml intramuscularly
4. Injection Melonex (Intas Pharmaceuticals, each ml contains Meloxicam BP 5 mg) -1 ml intramuscularly
5. Injection Belamyl (Zydus Animal Health Ltd, B-complex liver extract with Vitamin - B12) - 1ml intramuscularly.

After the operation was over, an antagonist for Xylazine: Yohimbine hydrochloride, 10mg/ml (Inj. Reverzine)-0.09ml was given by intravenously. During the recovery phase Injection Cefstan, Injection Melonex and Injection Belamyl were continued for seven days. Additionally Injection Avil (Pheniramine Maleate - each ml contains 22.75 mg) -0.5 ml was administered for the initial three days. Postoperative management consisted of withholding normal feed for 7 days. Only bananas, boiled egg and water with glucose and electrolytes were given to the animal followed by medicines for a week.

Result: After the surgery and the post-operative care the animal was normal and then released in the enclosure and normal feed provided.

Discussion: The obstruction was successfully removed. The case recovered without any complications. A rapid, accurate diagnosis based on history, clinical signs, physical and radiographic examination (Tyagi & Singh, 2002) together with rigorous post operative care led to the successful removal of the obstruction in a Himalayan Palm Civet.

Conclusion: Successful surgical intervention is possible in such rare cases arising in wild animals. The etiology behind such cases can vary but in this case one of the important factors was senility so this case presents a ready reference for such cases in future.

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Uterine Adenocarcinoma in an Indian one-horned Rhinoceros *(Rhinoceros unicornis)*

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The great Indian one-horned rhinoceros is an endangered species. Clearing of natural habitat owing to vast development in the interest of human welfare and poaching for monetary gains has finished up the rhino population from its large distribution range. In most of the zoos there are reports of breeding failure. The male rhinoceros in captivity suffers from low sperm count and females from uterine neoplasms due to sexual inactivity (Sweet, 2004). The present paper describes a case of uterine adenocarcinoma in a one horned rhino.

A 35-year old female Indian one-horned rhinoceros belonging to Nandankanan Zoo had a history of faecal impaction since 2nd week of June 1998. It had recovered with oral laxative, i.e. 2 litres of milk of magnesia administered in feed daily for 7 days. The rhino had chronic intermittent recurrence of loss of appetite and dullness since 2001 which was alleviated by administration of liver tonics and digestive enzymes. In Nov 2004 vaginal bleeding was noted in addition to dyspepsia and constipation. Oral styptochrome tablets 10 nos along with laxative improved the condition. The animal had never conceived during her stay in the zoo. On 20.5.07 the animal was off-feed again. Oral medication of liv-52 bolus (a herbal liver tonic containing Himsra, Kasani, Arjuna, Kakamachi, Mandura bhasma, Biranjasisha, Jhavuka and Kasamarda, Himalaya Drug Company, Bangalore) and digestive enzyme were offered through feed and ripe banana which she partially accepted. On 26.5.07 she was separated from the male for a better assessment and management. Loss of appetite and constipation continued despite all medication. Parenteral neohepatex (proteolysed liver extract having vitamin B 12 activity, Biological E. Limited, Hyderabad) 10ml was injected through blow pipe. On 27th May the rhino was wallowing in the enclosure but inappetance, dullness, flatulence, tenesmus of anal sphincter and uterine discharge were noticed again, and on 28th May she was found dead (Fig. 1 & 2*).

At necropsy, pale lungs with small sized papillomatous growths attached to the border, enlarged heart with endocardial haemorrhage, pale liver with a few necrotic patches, pale kidneys and blood stained fluid in the peritoneal cavity were observed. There were two large growths of about 2 feet diameter on both the uterine horns weighing approximately 25 kg each which occupied most of the abdominal space exerting pressure on the adjacent visceral organs (Fig. 3, 4, 5*). Histologic examination revealed glandular pattern of cuboidal to columnar cells arranged irregularly (Fig. 6*). The mitotic figures were low to moderate. Considering multiple occurrence and highly irregular pattern of the growth it was considered to be an adenocarcinoma.

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(*See Web supplement for images at www.zoosprint.org)

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Pasteurellosis in White Goose

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Fowl cholera or Avian Pasteurellosis is an infectious septicemia disease of wild and domestic waterfowl caused by *Pasteurella multocida*. The disease was reported in several species of cage birds (Mehrotra *et al*. 2000, Sawada *et al.* 1999). This paper documents a sporadic case of fowl cholera in goose at Arignar Anna Zoological Park, Chennai.

A two year old white goose found dead in the enclosure and brought to the Zoo hospital at AAZP. Post mortem examination revealed petechia hemorrhages in heart, trachea, lung and ecchymotic patches were seen in the serosal surfaces of abdomen, moderate congestion of intestinal musosa, hepatomegaly and on the surface of the liver numerous yellowish pinpoint necrotic foci were observed. Proventriculus and crop were found to be empty. And a sign of catarrhal enteritis was observed. Mild congestion was noticed in the spleen and kidney.

Microscopical examination of heart blood and lung impression smears revealed the presence of bipolar organisms. Cultural examination of heart blood, lung and liver exudates revealed the presence of *Pasteurella multocida*. Mehrotra *et al*., (2000) reported that Pasteurellosis either pneumonic or generalized septicaemic form, which could cause heavy morbidity and mortality amongst the birds due to stress by inclement weather or other factors or some other factors. Sawada *et al*. (1999) reported 18 out breaks of acute fowl cholera occurred in myna birds, wild ducks, green pheasants, copper pheasants, geese, laying chickens and broiler chicken in Japan.

Fowler (1992) opined that typical septicaemic lesions are observed in birds dying of fowl cholera.

Keeping in view of the impact of the disease, the following prophylactic measures were taken immediately.

1. All the birds were given with Broad spectrum antibiotics (Enrofloxacin @5 mg per kg body weight) for 3 days
2. All the birds were protected from inclement weather by providing proper shelter, bedding etc.
3. Bleaching powder and disinfectants was sprayed in the enclosure.
4. Water pond was cleaned and water purifiers were added.

After this preventive measure, further incidence of death was not observed.

It is known that the Pasteurella organisms are opportunistic pathogens, which are commonly present in the respiratory tract of animal and birds without causing the diseases and multiply to produce the diseases during stress due to overcrowding, change in weather, transportation or starvation etc., Mehrotra *et al*. (2000).

In this present case, inclement weather due to unprecedented rains during the diseases episode might have resulted in severe stress predisposing the infection.

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Isolation of Mixed Infection of Staphylococcus aureus from Bumblefoot in a Goose

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Bumble foot is a commonly occurring infection in poultry, water birds. It is a very common pathogen caused by *Staphylococcus aureus*, which is a Gram Positive bacteria. It causes localized infection of foot, with bulbous swelling of the footpad and surrounding tissues.

Clinical history: A flock of three geese were maintained at Japanese Encephalitis Laboratory, Veterinary Biological & Research Institute, Hyderabad for the purpose of Haemagglutination Inhibition test for testing animal and human sera samples for Japanese Encephalitis and Dengue. One of the birds was not active, off-feed and limping while walking. It was a unilateral case. On observation, it was found that swelling was enlarged and the base of the foot and tissue between the toes become distended at plantar region, which is hot, painful on touch. The next day itself swelling was ruptured due to continuous movement of the leg by the bird, which showed continuous bleeding from the affected area. The bird became lame and had a diminished appetite. The swelling was completely evacuated by pressing to remove the exudates formed. A blood swab was collected and sent to a microbiology lab for isolation, culture and sensitivity of the organism.

In the microbiology lab culture and sensitivity tests were performed. A sachet of Nitrofurantoin was available in lab, which was given at the rate of 5mg per kg body weight for 5 days. The ruptured abscess was drained by pressing and the area was cleaned by tincture of iodine and applied tincture iodine with Johnson adhesive tape and covered with polythene cover to prevent continuous wetting of foot. Like that for 3-4 days wound area was cleaned and dressed. The goose treated with antibiotic and along with supportive care was taken to improve the condition.

Prevention and control: The hygiene practice was followed in the JE lab to eliminate further infection to other birds. The infected bird was isolated and treated separately. Rotating the runs and removing the birds to a clean well drained yard are recommended as a preventive measure.

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Sighting of Bar-headed Geese *Anser indicus* (Latham) in the Mogral Puthur Estuary, Kerala

KM. Aarif[1] and Muhammed Basheer[2]

Mogral Puthur Estuary is one of the most important estuaries in Kasaragod district. The Mogral River is originating from the forests of Kantur in Karnataka border. After flowing for about 30km downwards, near Railway bridge, the river abruptly turns south forming a long stretch of backwaters about 4km in length. Finally near Mogral Kadappuram it discharges water to the Arabian Sea. The sea mouth and the adjacent areas are covered with a lush growth of mangrove vegetation. This Mangrove vegetation is dominated by species such as *Avicennia officinalis*, *Acanthus ilicifoius*, *Rhizophora mucronata*, *Aegiceras corniculatum*, *Excoecaria agallocha* etc. The mudflats, sandy beaches and the mangrove vegetation provide good habitats for shorebirds, gulls, terns and other waterfowls. As part of Asian water fowl census on 26th January 2009, the birds of Mogral Puthur Estuary were observed. A small group of Bar Headed Geese (six individuals) *Anser indicus* (Latham) was sighted on fresh water near the mangroves at an around 7.00 am. The birds seemed to be very actively swimming and feeding there. These Geese were watched for around half an hour.

Sight records of Bar- headed Goose are few from Kerala. Ali (1969) did not record this species in Kerala. In 1987 one bird was recorded from Kadalundy by D.N. Kurup (Neelakantan et al. 1993). Praveen & George reported three sightings of these birds during July 1999 and two records during January 2000 at Walayar dam. K.V. Eldhose spotted five Bar-headed Geese at Purathur, Bharathapuzha estuary, in December 2005. Again P.P. Sreenivasan (2006) spotted six birds at Kole Wetlands, Thrissur district. This species was last recorded from Kumarakam on 12th January 2009 at an around 7.30 am (Binoy K.M. Verbally). He reported seeing only one in flight and it landed in small paddy field.

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A programme for the students of Residential Balakiyara Baal Bhavan, part of Amphibian Ark - India campaign

S. Mamtha*

The Baal Bhavan is run by the State Government, the Women & Child Welfare Department in Karnataka State, India.

Dr. Krishnan, a participant in an earlier programme entitled "Teachers for Tigers", is one of the volunteer Educators and as per his invitation Amphibian ark program was conducted. Forty-five students got the benefit of this programme. These children are enthusiastic learners, but they do not have access to hand on materials to support their learning.

The programme was conducted at Balakiyara Baal Bhavan on Lalithamahal Road, Mysore on 22 May for 45 girl students aged 10-17 years. Objectives of the programme were as follows:
a) to understand the meaning of amphibian, chytrid sickness, endemic, etc
b) to understand the difference between frog & toad.
c) to recognize three groups of amphibians.
d) to understand, why do frogs matter so much?
e) to know why should we worry about frogs?
f) to know the Indian Amphibian status and
g) to encourage the learner to be part of AArk!

To start with, "rain clap" game was played as an energizer. This led to talk on rain and the scene after the rain. Children talked about the smell of soil after rain, as well as windy breeze, hail stones, pearly water droplets etc, and finally about croaking and leaping frogs.

Sixth grader, Latha, confessed that, she used to catch tadpole thinking them as baby fishes. Sudha, 4th grade student said, 'I have seen frogs at night too, sometimes when I wake up to use rest room'. This led to speaking about nocturnal behavior in frogs by the facilitator. Students were told about three groups of Amphibians, their habit and habitat, frogs' role in the food chain, etc. Children were also made aware of deforestation, pollution and pesticides, fragmentation and chytrid sickness.

AArk packets issued by ZOO was distributed. The children were happy to receive Amphibian Ark tool kits. They were asked remove the *Rakhi* (wrist bracelet) and to tie it on the wrist of their beloved pal. The girls were further divided into junior and senior groups to have different activities according to their understanding level. Junior students had activities like frog race, drawing, and skit 'frog talk'. Senior students played role-play having roles as researcher, conservationist, farmer and frog.

Passing the message was the next game to tell them how Amphibian Ark India campaign can be successful if they too become part of Aark! Soon after this game students, in order to be a part of AArk, did the signature on the AArk petition form prepared by Zoo Outreach Organisation. The senior students had Frog quiz as assessment tool. Their active participation was appreciated and amphibian sticker-bookmarks were given as a token of appreciation while the juniors had attitude assessment.

Finally students expressed what they learnt through a wall drawing. As an organizer, I enjoyed materials and could meet my objectives having these tool kits as teaching aid. Intern kids were very happy to have hand on materials.

I thank Dr. Krishnan for his kind invitation. My gratitude to Zoo Outreach Organisation for providing education tool kits free of cost and kind support and guideline to conduct this program. I take this opportunity to thank international sponsors for their kind support, namely Sea World / Busch Gardens, USA and Amphibian Ark as well as CBSG WAZA and ASG SSC IUCN.

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Conservation Education: Buildling on existing platforms at Don Bosco School

In the course of our conservation education-awareness programmes with Don Bosco school we have nurtured an amiable rapport with concerned teachers. One day one of them came saying that an exhibition was planned at Saiha and the onus of representing the school fell on his shoulders; besides Don Bosco being the host had to do well. This was the SCERT annual science exhibition and he asked me to suggest possible avenues of participating in an apt fashion. We read the document together and it immediately struck me that we could work under the theme "Conservation of Natural Resources". This also would be tantamount to taking our ongoing programme with Don Bosco to the next stage. It also occurred to me was what while I have been talking of generating synergies with state agencies as also working in a reactive mode, this was a good opportunity.

We discussed undertaking a survey focusing on Hoolock gibbons in Saiha involving a small group of students and sharing of the process and findings as the model we would display in the exhibition. The survey, which would reveal people's awareness and perception of this rare primate, would have multiple choice questions and be undertaken within Saiha town. A few phone calls and a meeting later we had 50 copies of the questionnaire and an outline of the method lay in front of us. Time at disposal being short the survey began.

We then met at the school to collate the findings. Students had done a neat job, from writing the numbers on each questionnaire to getting the crux of the findings. Since the questionnaires were filled using 2 languages depending on the respondent we took note of all the responses after translating the ones in Mizo to English. In course of this we discussed the experience of the students and I realized that while they were enthused none of them had seen a Hoolock gibbon. In the next preparatory meeting I screened the film "A Hunter's Tale" to enable them to see the Hoolock gibbon, hear it and get a glimpse of where it lived. This would make it easier for them to talk of the primate. After this we set out to discuss how we would share the findings, the charts we would display and the design of posters. At this stage we realized that we had not coined a name for our project and subsequent scratching of our heads resulted in the project title being "**Pride of Maraland**".

A day before the event when we were allotted space to showcase our project I went to the school to give my limited inputs in last minute fine tuning. We discussed the need to clean the space as also the height at which we would put up the posters. We also got some copies of the questionnaire and the "process" ready in case people attending wanted to know more. The team was busy with the ongoing registrations of the event; schools from all over the state were participating.

While we were not selected for the national level exhibition we had achieved what we had set to do and had achieved it well. We got students involved in an action of conservation education and awareness by way of doing surveys and collating the findings. This was a step ahead of our regular interactions with them wherein most cases they received information. We got to know how people perceived Hoolock gibbons in a district which has troops of the primate in community-owned lands, which is referred to as having the best remaining rainforests in north eastern India. Most importantly we spread two critical messages to students of almost all schools in Saiha who attended the exhibition, that is that Hoolock gibbons need to be conserved and there are efforts ongoing, towards this, in Saiha by way of conservation education awareness.

Thanking the teachers, students in the team and Don Bosco school Saiha. These efforts are undertaken in collaboration with the Mara Autonomous District Council (MADC) and educational institutions & youth associations active in the region.

Also thanking Kalyan Varma and Aparajita Datta for sharing the film and Zoo Outreach Organization for sharing material on Hoolock gibbon. ***Submitted by Nimesh Ved (nimesh.ved@gmail.com), Samrakshan Trust. Check their blog http://mizoram-samrakshan.blogspot.com***

Hoolock gibbon pair as depicted by the team

Keeping Hoolock gibbons as pets is a big threat, a month before the exhibition the team had come across one freshly taken as pet in Saiha

Report of using the Amphibian colouring book for education

S. Mamtha*

On May 16 2009, twenty two students of various grades took part in this Amphibian Ark art activity. Sethu Bandha Trust had arranged a free summer camp for these economically backward students of 8-14 years of age to provide free education on various topics. The author was invited to give a programme on the Amphibian Ark. The programme was held in Simha Bhavan, Mysore West.

The materials utilized were Amphibian colouring books and the Amphibian Ark tool kit produced and provided by Zoo Outreach Organisation. The objectives for the exercise included learning the meaning of amphibian, endemism, understanding differences between frogs and toads, knowing the three groups of frogs and their habitats, understanding the important of frogs and their role in the food chain.

A "Rain" game was perfect to play and introduce the theme of amphibians. The students sang folk song related to frogs and shared their knowledge about thems. Frog wedding incidents in their grandparent's village amazed me! Songs, stories, and myth…! The students seemed to know much about frogs but not about all three groups of amphibians.

With the help of the drawing book and Amphibian Ark tool kit, it was easy to teach them the facts about amphibians. Kids were encouraged to sign the AArk petition form to be part of AArk. After signing the petition form children promised to raise awareness among their fellow students and parents about amphibians and the extinction crisis they face.

One of the most popular games, the frog race or hopping race was conducted for the small children. Children were asked to go through the drawing book to read what they have learnt. Finally, kids selected their favourite page to colour. While colouring, they were allowed to narrate 'frogs talk' as assessment tool.

As an educator, I would always look for informal playtime approaches to impart the subject, as well to create interest towards daily life wildlife. The Amphibian Ark drawing book is wonderful teaching aid to import the subject effectively.

Acknowledgements
Thanks to ZOO for publishing Amphibian colouring book a novel drawing book to impart the amphibian subject in play-way approach, and also to Busch Gardens, Sea World sponsors of the materials provide by ZOO, AArk, SAN-IZE.

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Report on Nature Guide Training in Nepal

Yogendra Lama*

The National Trust for Nature Conservation NTNC, a leading NGO in Nepal dedicated to the conservation of nature and natural resources by balancing human needs had set up the Biodiversity Conservation Center (BCC) a major undertaking of NTNC. Before January, 2002, BCC was known as Nepal Conservation Research and Training Center (NCRTC) but renamed to BCC to expand its scope into holistic biodiversity conservation within the Terai region of Nepal. The overall objective of BCC is to support NTNC in its mission of conserving biological diversity.

BCC has been conducting various alternative livelihood programs to the community living in the periphery of Chitwan National Park. Among one, the capacity building endeavors, BCC has provided nature guide training to more than 900 local people in order to cater to the growing number of tourist visiting to Chitwan National Park.

Training Rationale: International Tourism is expected to increase well into this millennium, with growing focus on the developing world. Nepal is known as one of the best destinations for nature based tourism. Properly enacted nature tourism can safeguard protected areas by providing revenues to local communities as an incentive to respect the protected areas. Furthermore, eco-tourism goal is to capture a portion of the global travel market by attracting visitors to natural areas and using the revenues to fund local conservation and fuel economic development. Nature guides are explicitly linked with tourism activities in natural areas, where if they are properly trained can stimulate conservation and development activities. Thus, Nature Guide Training was organized by NTNC Biodiversity Conservation Center to the youths from Chitwan and Nawalparasi Districts of Nepal.

Objective of the training

The primary objective of the Basic Nature Guide Training is to impart the knowledge about flora and fauna of CNP and guiding knowledge as well to the local youths. There are excellent opportunities for wildlife viewing and promoting the concept of community-based biodiversity conservation. The development and implementation of tourism initiatives under the “incentive principle” presumes that communities are more likely to embrace biodiversity conservation if they derive tangible economic benefit from nature guiding, jobs with travel companies, guesthouse operations, or rental services, etc. However, this requires that such incentives are not only carefully developed but also perceived as being implicitly linked with conservation action in the eyes of the beneficiaries. Local people need to be given job skills training in order to raise service standards and compete more effectively with outsiders, and the locally provided nature guide services must be suitably marketed among local and outside travel agents.

The overall objective of the training programme is to provide local employment opportunity in tourism of Chitwan National Park to develop tourism quality and to promote awareness of the biodiversity of Chitwan National Park to youth and involve them in community conservation. The 6 day - training was scheduled from 23 – 28 March, 2009 in Biodiversity Conservation Center, Sauraha, at Chitwan district. There were 21 young participants. The training was very productive. It has provided a wide spectrum of culture, tourism, and biodiversity knowledge to the participants.

Among many themes and sessions such as ethics, role and responsibility of nature guide, protected area management, wetland conservation and management in Nepal, role and importance of invertebrates, birds, and other wildlife, plants, observation techniques there was a two hour sesson on Human Elephant Coexistence HECx.

As guided by HECx curriculum and taught by Zoo Outreach Organisation during the training held at Chitwan earlier in March, I introduced the several topics which were covered in the Nature Guides Workshop, teaching and leading discussion. Trainees enjoyed the information and activities and energetically participated. Due to the limited time in the session, we could not cover as many topics as expected but it was, nevertheless an engaging and effective experience for me and the participants. The topic utilized for this module of the Guides training were:

- The meaning of Human - Elephant Co-existence and mitigation of conflict
- Elephant status and distribution in the World and Nepal: Past and Current
- Asian Elephant in Asian Culture
- Mini dramas

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HCEx –Education Report from Central Zoo, Nepal

Arun Narsingh Rana*

The Conservation Education Section of National Trust for Nature Conservation, NTNC/ Central Zoo has organized a two-day program entitled "Wildlife Excursion Tour to Shivapuri" held on 7-8 May, 2009. There were 40 students from different schools. This Program was based on two themes in two parts:
a. Biodiversity and b. Human Elephant Co-existence HECx. It was conducted by CE Officer Rachana Shah, and CE Assistants Matisara Dahal and Arun Rana.

Participants were given a hearty welcome and then briefed about the program by Rachana. The programme included these sessions:

- Importance of biodiversity in environment (Rachana);
- Know each other with animal sounds (Rachana, Matisara and Arun);
- Protected Areas of elephant in Nepal (Arun);
- Do's and Don't's of humans in respect to elephants (Arun);
- Difference between Asian and African Elephant (Arun);
- Elephants in culture (Arun)
- Drama (Matisara)

The dramas were based on these themes
a. Human Elephant Conflict
b. Poaching and hunting
c. Why does my village attract Elephants?
d. Rescuing elephant but avoid dangers.

There was a field visit with student's rally and reach to Hattisar. Also we identify some differences between Asian and African elephant with the help of Pawankali who is the Asian elephant of Central Zoo.

On the second day all the students who participated were taken to Shivapuri National Park, Kathmandu

Information Sheets were given to the students: 1. Elephant Etiquette and 2. Differences in African and Asian Elephants.

1. Elephant etiquette and philosophy for survival of man and animal

Do's
1. If you have to run from an elephant, do so in zig-zag path.

2. Use terrain (especially very steep slopes) to discourage the elephant.

3. Cooperate with forest department when they are driving elephants in the forest.

4. Cultivate crops that are not liked by elephant.

5. Learn more about elephant behaviour.

6. Carry torch or other light during at night .

7. Listen for elephant presence in the forest- branches breaking, snuffling etc.

8. Share your techniques for avoiding and other useful information about elephants with others.

9. Follow the rules in a Protected Areas and other wildlife agency rules.

Don't's
1. Don't block elephants while driving in the forest.

2. Don't leave food in the open, particularly smelly food.

3. Don't take elephant fences (or any one method) for granted.

4. Don't go close to wild elephants.

5. Don't walk or stagger in the forest while drunk.

6. Don't walk in the forest while smelling alcohol.

7. Don't walk on traditional elephant paths.

8. Don't wear white or bright cloth.

9. Don't use flash camera, this annoys elephants.

10. Don't smoke- this annoys elephants.

11. Don't disturb feeding elephant in the forest.

	African Elephant	Asian Elephant
2. How do African and Asian elephant differ?		
Weight	4000-7000 Kgs	3000-6000 kgs
Shoulder height	3-4 metres	2-3.5 metres
Skin	more wrinkled	smoother
Highest point	on the shoulder	on the back
Size of the ears	bigger, reach up over the neck	smaller, don't reach over the neck
Shape of the back	Concave	Convex
Shape of the belly	diagonally downward direction of hind legs	-
Shape of the head	No dent	Dented

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ZooLex Zoo Zürich Himalayas Exhibit for Siberian Tigers

See the web version of this article with large, attractive photos at http://www.zoolex.org/zoolexcgi/view.py?id=730

Monika Fiby (Author for ZooLex)
Andreas Hohl (Editor for Zoo Zürich)
Monika Lange (Translator for ZooLex)
Monika Fiby (Editor of the translation)

LOCATION

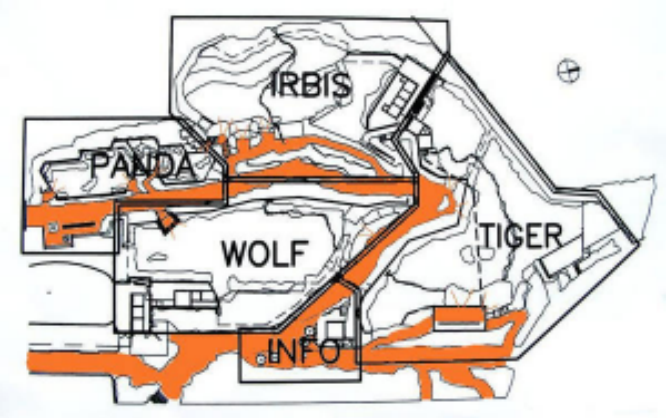
Zürichbergstr 221, CH-8044 Zurich, Switzerland Phone: ++41-44-254 25 00
Fax: 254 25 10
URL: http://www.zoo.ch

ANIMALS

Family: Felidae; Species: *Panthera tigris altaica*
Common Name: Siberian Tiger; Capacity: 1.1 with offspring or 1.2

DESCRIPTION

The Himalayas serve as the uniting theme for the new exhibits that showcase Siberian tiger, Mongolian wolf, snow leopard, and red panda. The visitors are welcomed at an information plaza which is framed by stacked stone walls. Buddhist prayer flags are attached horizontally between four big stone piles. These symbols connect the exhibit to the culture of the region.



Site plan - The Himalayas exhibit is accessed via an interpretion plaza and circulation around the wolf enclosure. Leaving the red panda enclosure the visitor reaches aviaries with Eurasian birds. ©Zoo Zürich, 2002

On the steep expanse, the enclosures were arranged according to the natural occurence of these high-mountain animals: Tiger and wolf below, red panda in the middle range, and snow leopard on top. Depending on precipitation, more or less clear water flows through the snow leopard enclosure, crosses the wolf enclosure next, and is finally received by the swimming pool of the tiger. Each enclosure displays a specific character introducing the visitors to the natural habitat of each animal species.

The tiger exhibit shows a section of mountainous, grassy landscape with cloud and decidious forest. At the lowest part of the enclosure water forms a lake. The design tries to offer the tigers a varied and naturalistic habitat.

The enclosure is bordered by a 4 m-high fence with a 1 m-deep overhang and a 3m-high artificial rock wall with 2 m-hich electrical wire on top. Viewing is provided by sections of glass panels, piano wire, and perforated metal.

SIZE

The entire Himalayas area encompasses 7400 m². 3250 m² of this are visitor areas, 3450 m² are outdoor enclosures, 470 m² are service areas, and 230 m² are buildings.

The outdoor enclosure for the Amur tigers has two viewable parts. The bigger exhibit is 1031 m². The smaller part can be used to separate animals. It is 246 m² big. An additional 61 m² separation enclosure is behind the scenes.

The pool in the main enclosure has a volume of 50 m³, and a second one in the behind-the-scences enclosure is 5.7 m³. The holding building is about 45 m² and a 25 m² separate building holds the life support systems.

Space allocation in square meters:

Use	Indoors		Outdoors		Total exhibit
Animals	Accessible	Total	Accessible	Total	
Visitors					
Others					
Total		70		1,338	1,408

COSTS

CHF 7,000,000 including 20% for design. The costs include the entire Himalaya exhibit with all four enclosures for Siberian tiger, Mongolian wolf, snow leopard, and red panda.

OPENING DATE: 22 August 2001

DESIGN: Beginning: March 1997.
• Project Management / Landscape Architect: Vetsch, Nipkow Partner, Zürich.
• Architect: Marc Ryf, Zürich.
• Engineer: Peter Osterwalder, Oberneunforn.
• Media Planner / House Technology: Schudel + Schudel, Kollbrunn.
• Electrical Engineer: Schmidiger + Rosasco AG, Zürich.

CONSTRUCTION: Beginning: 21 April 1999·
• Sanitary, plumbing, roofing: Preisig AG, Zürich.

• Aquaria Planner: Joseph Nietlispach, Aquariumtechnik, Wohlenschwil.
• Metal Construction: Analp Metallbau AG, Zürich.
• Horticulture: A. + D. Berger, Kilchberg.
• Electrical Construction: E. Burkhalter Ing. AG, Zürich.
• Building construction: Diener AG, Zürich.
• Construction: K. Eicher, Bauunternehmung AG, Regensdorf.
• Shotcrete: Laich SA, Avegno TI.

PLANTS
The climatic conditions of Zurich are comparable to certain height and vegetation levels in the Himalayas, which made it possible to use plant species that are related to those at the original location.

The plant selection for the tiger exhibit mirrors the mountainous fringes of the taiga with coniferous and deciduous forest and grasslands with sparse bushes.

FEATURES DEDICATED TO ANIMALS
Great care was taken to include enrichment opportunities into the design. The tigers use the offered stone pedestals as resting and viewing platforms. Logs, living trees and the pool trigger climbing, marking and swimming. A shifting gate to the neighboring exhibit allows the wolfs to visit, which enriches the enclosures with new stimuli. Llamas, alpacas, and ponies are led through the zoo several times a week, specifically also near the tigers and lions to incite hunting behavior.

Feeder Box - The tigers have to roam their territory to find prey. These feeder boxers are distributed in the enclosure. The magnetic locks are remotely controlled. Each box only opens for 15 minutes twice each day. Not all the boxes are filled every day. ©Monika Fiby, 2004

A crank in the visitor area moves a rope in the exhibit and "invites" the tiger to play. The current inhabitants of the enclosure have not shown interest in this kind of entertainment yet. Hanging bags with changeable contents offer additional possibilities for behavioral enrichment.

Creek - The artifical creek runs through the separation enclosure. ©Monika Fiby, 2004

Eight automated feeding boxes are filled in irregular intervals. The boxes are programmed to open at arbitrary times, which forces the animals to 'hunt' for their food. This kind of feeding management proved to be very effective in preventing stereotypical behaviour. Big meat portions are hung in the exhibit from time to time.

FEATURES DEDICATED TO KEEPERS
The animals can be separated or shifted by confining them into the smaller part of the exhibit or into the holding cages. They spend day and night throughout the whole year outside and are only confined to the inside holding cages while work is done in the outside enclosures. The shifting doors and the handles are marked by corresponding colors to prevent mistakes. A transportable squeeze chute is located between the indoor cages. The post used to hang big meat portions has a swing arm to facilitate loading from outside of the enclosure.

The filtration system is explained by a list of instructions and graphics.

FEATURES DEDICATED TO VISITORS
A big visitor shelter with glass viewing as well as perforated screens allow the visitors to view the biggest part of the exhibit. The perforated screens allow not only for visual contact but also for an olfactory meeting. An additional viewing point makes the smaller part of the enclosure visible to the visitors.

INTERPRETATION
The signage about the biology of the animals conforms to signage used in the entire zoo. Additionally, special signs offer information about the threats to tigers, as well as the involvement in conservation efforts by the Zoo Zurich.

Signs with flaps explain the facial expressions of tigers. Along the visitor path, casts show tracks, droppings, and feeding sites left by tigers. By

Visitor view. ©Dirk Petzold, 2002

pressing buttons, the visitors can also listen to different tiger sounds.

MANAGEMENT

Approximately four times a week the food boxes are loaded. Of the eight available boxes not all are filled every time. A soundless magnetic lock is opened by remote control four times each day for 15 minutes. When the animals are hungry, they patrol the enclosure and check the boxes for food availability. They have to open the boxes actively to get to the food.

Relaxing Tiger - In an exhibit like this a tiger can relax. ©Zoo Zürich, 2002

Boom - The feeding boom can be swung to the outside of the exhibit to hang meat. ©Monika Fiby, 2004

RESEARCH

Saskia Jenny and Hans Schmid examined in a 2001 study if the stereotypical repetetive behaviours at Zoo Zurich are caused by frustrated hunting behaviour. Experiments with the food boxes confirmed this hypothesis. See Zoo Biology 21: 573-584 (2002)

CONSERVATION

Zoo Zurich takes part in the EEP for the conservation of Siberian tigers. The water features in the tiger exhibit are part of a closed circuit. The water is cleaned by pressure sand filters. Evaporation is compensated for through run-off and spring water.

Visitor Shelter - The shelter is bordered by wood stacks. ©Monika Fiby, 2004

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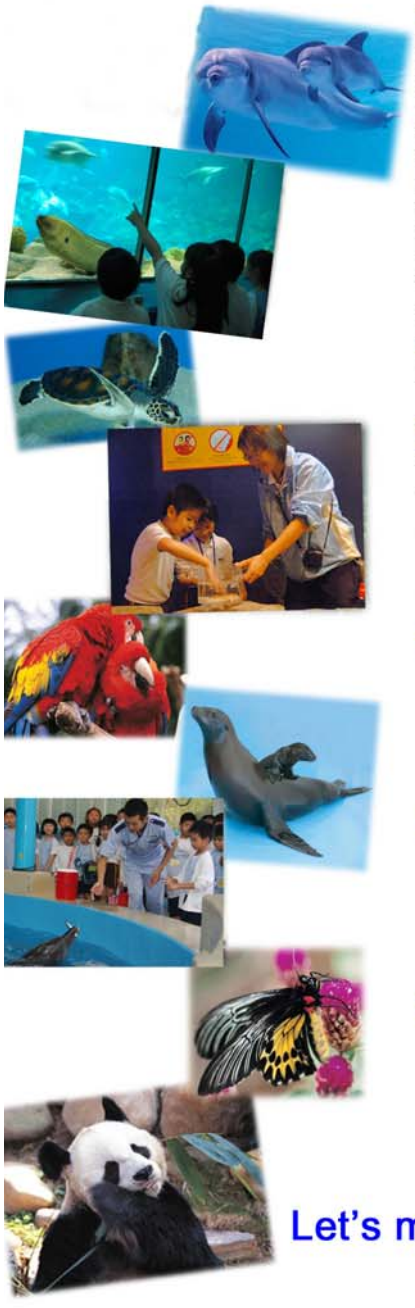
Saving the melting earth with limited resources but immense ideas



INTRODUCTION

Nowadays, zoos should not only provide entertainment, but also edutainment for visitors. Zoo is the best place to convey animal information and conservation message in the city. People can surely enjoy learning in zoo through education programme. To enrich and improve education programme in zoo, sharing is the key element. Asian Zoo Educators' Conference serves as the best platform for zoo educators to exchange, learn and expose ideas from different parts of Asia.

The second Asian Zoo Educators' Conference will be held at Ocean Park Hong Kong from 11-16 October 2009. "Saving the melting earth with limited resources but immense ideas" will be the theme of this conference. Register now and share your great ideas with us!

CALL FOR PAPERS

You are invited to present and share your research or experience with us. You are welcome to submit papers, videos, posters or plan for a workshop according to the conference theme. English will be the main language for this conference. For presentations and papers in other language, please contact us for further assistance.

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DATES TO REMEMBER

Presentation Registration: March-June 2009
Early Bird Registration: Before 30 June 2009
Standard Regisration: Before 30 August 2009
Sponsorships: Before 30 June 2009

CANCELLATION

Should there be insufficient applicants, Ocean Park Hong Kong will consider cancelling this conference. We will inform registered attendees by email no later than 10 July 2009. Please reserve accommodation and flight after receiving confirmation from us.

Let's meet at Ocean Park Hong Kong in October 2009!

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