Volume 1 • Number 2

roots

Botanic Gardens Conservation International Education Review

October 2004

Botanic gardens and zoos synergies for the future

Taking a holistic approach

From the lion's cage

Partnerships for learning

Should botanic gardens keep animals as exhibits?

BGCI

Plants for the Planet

Editors: Julia Willison and Sarah Kneebone

Cover Photo: San Diego Zoo, USA

Design: John Morgan, Seascape
Email: studio@seascapedesign.fsnet.co.uk

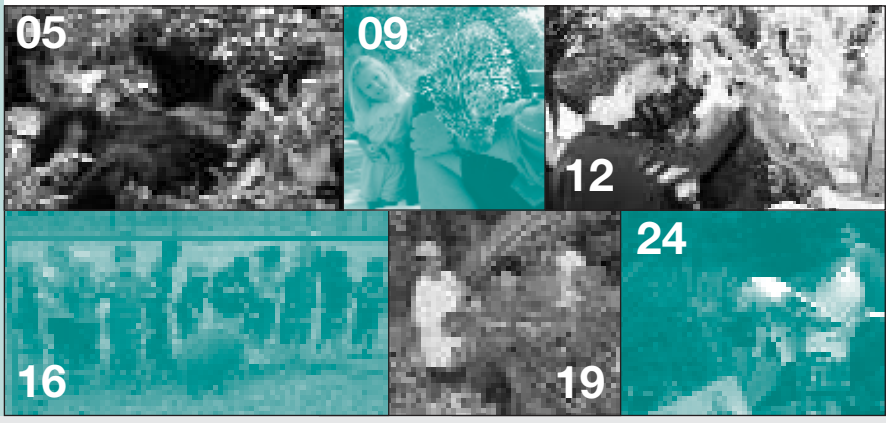
Forthcoming Issues
Volume 2 Number 1 – International agendas: implications for botanic gardens
Last submission date January 20, 2005
Volume 2 Number 1 – Master planning for education
Last submission date June 20, 2005

Roots is produced by **Botanic Gardens Conservation International (BGCI)**. It is published twice a year and is sent to all BGCI members. Membership is open to all interested individuals, institutions and organisations that support the aims of BGCI (see inside back cover for membership application form)

Further details available from:
- Botanic Gardens Conservation International, Descanso House, 199 Kew Road, Richmond, Surrey TW9 3BW UK. Tel: +44 (0)20 8332 5953, Fax: +44 (0)20 8332 5956 email info@bgci.org, www.bgci.org
- BGCI-Russia, c/o Main Botanical Gardens, Botanicheskaya st., 4, Moscow 127276, Russia. Tel: +7 (095) 219 6160 / 5377, Fax: +7 (095) 218 0525, E-mail: seed@aha.ru, www.bgci.ru
- BGCI (U.S.) Inc., c/o Dan Shepherd, Director, 1000 Washington Avenue, Brooklyn, New York 11225-1099, U.S.A. Tel: +1 718 623 7200, Fax: +1 718 857 2430, www.bgci.org/us
- BGCI-Netherlands, c/o Utrecht University Botanic Gardens, P.O. Box 80162, NL-3508 TD, Netherlands. Tel: +31 30 253 2876, Fax: +31 30 253 5177, E-mail: l.j.w.vandenwollenberg@bio.uu.nl, www.bi.uu.nl/botgard
- BGCI-Canarias, c/o Jardín Botánico Canario Viera y Clavijo, Apartado de Correos 14, Tafira Alta 35017, Las Palmas de Gran Canaria, Gran Canaria, Spain. Tel: +34 928 21 95 80/82/83, Fax: +34 928 21 95 81, E-mail: jmlopez@grancanaria.es
- BGCI-China and South East Asia, c/o Registry, Singapore Botanic Gardens, 1 Cluny Road, Singapore 259569. Email: Bian.Tan@bgci.org, Email: anle.tieu@bgci.org, www.bgci.org/china
- BGCI-Colombia , c/o Jardín Botánico de Bogotá, Jose Celestino Mutis, Av. No. 61-13 – A.A. 59887, Santa Fe de Bogotá, D.C., Colombia. Tel: +57 630 0949, Fax: +57 630 5075, E-mail: jardin@gaitana.interred.net.co, www.humboldt.org.co/jardinesdecolombia/html/la_red.htm
- BGCI-Deutschland, c/o Botanische Gärten der Universität Bonn, Meckenheimer Allee 171, 53115 Bonn, Germany. Tel: +49 2 2873 9055, Fax: +49 2 28731690, E-mail: biogart@uni-bonn.de

BGCI is a worldwide membership organization established in 1987. Its mission is to build a global network for plant conservation. BGCI is an independent organization registered in the United Kingdom as a charity (Charity Reg No 1098834) and a company limited by guarantee, No 4673175. BGCI is a tax-exempt (501(c)(3) non-profit organization in the USA and in Russia.

Contents



BGCI would like to thank the co-editors for their work in the production of Roots:

For the French Section:

Loïc Ruellan – Conservatoire Botanique de Brest, France
Allison Marshall – Planète Sciences Méditerranée, France
Françoise Brenckmann – Muséum National d'Histoire Naturelle, France
Thierry Helminger – Musée National d'Histoire Naturelle, Arboretum Kirchberg, Luxembourg

For the Spanish Section:

Maricela Rodriguez Acosta – Herbario y Jardín Botánico de la Benemérita Universidad Autónoma de Puebla, México
Veronica Franco – Centro de Investigación Cientifica de Yucatán, A.C. (CICY) Mexico
Antonio J. Lopez-Quintana – Euskal Herriko Univertsitatea, Universidad del Pais Vasco, Bilbao, Spain
Lourdes Rico-Arce – Royal Botanic Gardens Kew, U.K.

Jardins botaniques et zoos: synergies pour le futur

Jardines botánicos y zoos: sinergias para el futuro

Julia Willison

Botanic gardens and zoos

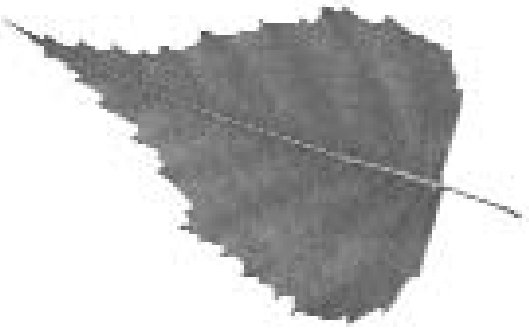
synergies for the future

Editorial - English

From unplanned menageries to systematic collections, the evolution of zoos and gardens has always reflected current thinking. It is no surprise then, with growing international awareness and concern for the environment, that botanic gardens and zoos are now at the forefront of biodiversity conservation.

The imperative for partnerships and biodiversity education is highlighted in the Convention on Biological Diversity and reinforced in the Global Strategy for Plant Conservation to which 188 countries have signed up. This issue of Roots examines some of the synergies that exist between gardens and zoos and showcases programmes that offer a holistic approach to environmental education.

In our lead article, John Arnot, Curator of Geelong Botanic Garden, Australia, provides the historical context for the development of zoos. He argues that,



Editorial - Français

De la simple ménagerie aux collections systématiques, l'évolution des zoos et des jardins a toujours reflété le courant de pensée de son époque. Il n'est pas surprenant qu'avec l'accroissement de la sensibilisation et de la conscientisation pour l'environnement les jardins botaniques et les zoos sont aujourd'hui en première ligne dans le domaine de la conservation de la biodiversité.

Dans la Convention sur la Diversité Biologique, l'accent est mis sur les besoins en matière de partenariats et d'éducation à la biodiversité, et cela est renforcé dans la Stratégie Globale pour la Conservation des Plantes qui a été signée par 188 pays. Ce numéro de Roots souligne les synergies qui existent entre les jardins et les zoos et présente des exemples de programmes qui offrent une approche globalisante de l'éducation à l'environnement.

Dans l'article qui ouvre notre revue, John Arnot, Conservateur du Geelong Botanic Garden, en Australie, rappelle le contexte historique du développement des zoos. Même s'il sait qu'il ne sera pas possible de réaménager la plupart des institutions actuelles, il développe le concept de Bioparc qui est l'évolution logique des reconstitutions de milieux présentées dans les zoos et des institutions d'histoires naturelles à travers le monde. D'un point de vue éducatif, il argumente que le concept du Bioparc offre l'occasion de montrer

Editorial - Español

Desde simples colecciones privadas de animales hasta colecciones sistemáticas, su evolución ha reflejado el pensamiento de cada momento. No sorprende que, con la creciente conciencia medioambiental, los JJBB y Zoos se encuentren en primera línea de la conservación de la biodiversidad.

La necesidad de asociación y cooperación entre instituciones queda bien definida en la Convención de Diversidad Biológica, y reforzada por la Estrategia Global para la conservación de las plantas firmada por 188 países. Este número de Roots muestra las sinergias entre JJBB y Zoos, y exhibe los programas que ofrecen un enfoque holístico de la educación ambiental.

En el primer artículo de John Arnot, Conservador del JB Geelong de Australia se analiza el contexto histórico del desarrollo de los zoos. Argumenta que el Biopark es la consecuencia lógica de los Zoos y establecimientos naturalísticos del mundo. Desde una prespectiva

while it may not be possible for many established institutions to achieve, the Biopark approach is a logical extension of naturalistic exhibits for zoos and natural history institutions worldwide. From an educational standpoint, he argues that the Biopark model provides an opportunity to demonstrate the complex interrelationships between plants, animals and the environment. The Nilgiri Biosphere Botanical Garden and Conservation Park, India, is an example of a Park moving towards this ideal. Sally Walker et. al describe the development of this new initiative which aims to replicate in microcosm the native environment, while conserving the endemic and threatened flora and fauna of the area. Albuquerque Biopark, USA, offers us another model. Catherine Hubbard, explains that the BioPark comprises a zoo, aquarium and botanic garden and, although located on different sites, they share the same mission and are administered by one director. Her article addresses the benefits and challenges of integrating the various education programmes and demonstrates that, through collaboration, visitors can gain a more comprehensive view of life on earth.

Unquestionably zoos and botanic gardens offer superb locations for education. However, as Jamie Copsey from Jersey Zoo, UK, points out in his article, there is still a woeful dearth of education officers in zoos and gardens, particularly in biodiversity-rich countries. Jamie argues that we need to find ways of matching resources in both gardens and zoos in order to be an effective collaborative force for conservation education. He suggests that capacity building is one way in which resources may be shared and highlights the benefits gained by more

les inter-relations complexes qui existent entre les plantes, les animaux et l'environnement. Le Nilgiri Biosphere Botanical Garden and Conservation Park, en Inde, est un exemple de parc qui tend vers cet idéal. Sally Walker et al décrit le développement de cette nouvelle initiative qui a pour but de recréer, dans un microcosme, le milieu ambiant dans lequel il est situé, tout en conservant les espèces végétales et animales menacées et endémiques de cet endroit. Le Bioparc d'Albuquerque, aux Etats Unis, nous offre un autre exemple. Catherine Hubbard explique que le Bioparc est constitué d'un zoo, d'un aquarium et d'un jardin botanique et, bien qu'ils soient situés dans des endroits différents, ils partagent les mêmes missions et sont administrés par le même directeur. Son article indique les bénéfices et les défis qu'il y a à intégrer des programmes éducatifs variés et démontre que grâce à une vraie collaboration, les visiteurs peuvent avoir une vision plus compréhensible de la vie sur Terre.

Sans aucun doute, les zoos et les jardins sont des endroits superbes pour l'Education. Cependant, comme l'indique dans son article Jamie Copsey du Zoo de Jersey au Royaume Uni, il subsiste toujours un manque déplorable d'animateurs dans les zoos et les jardins du monde entier, en particulier dans les pays à forte biodiversité. Jamie pense qu'il est indispensable de mettre au point des ressources complémentaires dans les jardins et les zoos pour constituer une force de collaboration efficace destinée à l'éducation à la conservation. Il suggère que le développement de compétence soit une voie par laquelle les ressources puissent être partagées et il souligne les bénéfices acquis par les plus de 1000 étudiants qui ont suivis des cours au centre international de formation du Zoo de Jersey. Comme le propose Jamie, avec la convention sur la Diversité Biologique qui met l'accent sur l'approche des écosystèmes pour conserver la biodiversité, peut-être est-il temps pour nous de mettre en place une formation débouchant sur un Diplôme International d'Education dans les Zoos et les Jardins ?
Très certainement le développement de compétences fut un élément essentiel pour expliquer le succès du Munda

educativa, considera que el biopark proporciona una oportunidad para exhibir las complejas interrelaciones entre plantas, animales y medio ambiente. El JB Nilgiri Biosphere Conservation Park de la India es un ejemplo de parque que aspira a este ideal. Sally Walker et al. describen el desarrollo de esta nueva iniciativa que intenta reproducir en un microambiente el lugar sobre el que se asienta, conservando la flora y fauna endémica amenazada del lugar. Albuquerque Biopark de EEUU nos ofrece otro modelo. Catherine Hubbard explica que el BioPark está compuesto por un zoo, un acuarium y un JB que, a pesar de estar localizados en diferentes lugares, comparten la misma misión y son administrados por un único director. Su artículo trata acerca de los beneficios y desafios de integrar diversos programas educativos, y demuestra que los visitantes pueden conseguir un conocimiento más completo de la vida en la tierra.

No hay duda de que JJBB y Zoos son magníficos escenarios para la educación. Sin embargo, como Jamie Copsey del Jersey Zoo de RU señala en su artículo, hay una evidente falta de educadores en ambas instituciones de todo el mundo, especialmente en los países de alta biodiversidad. Jamie opina que tenemos que encontrar recursos en Jardines y Zoos para ser una fuerza efectiva en la educación para la conservación. Sugiere que la capacitación es uno de los medios para que los recursos se compartan, y subraya los beneficios obtenidos por más de mil estudiantes que han pasado por el International Training Centre en el Jersey Zoo. Ya que la Convención sobre Biodiversidad ha recalcado la necesidad de un enfoque ecosistémico en la conservación de la biodiversidad, ¿quizá habrá llegado el momento de organizar un nuevo Diploma Internacional de educación en Zoos y JJBB?

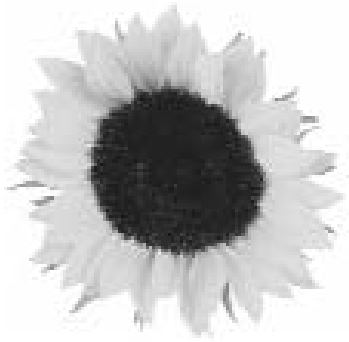
Seguramente la capacitación ha sido crucial en el éxito del Parque Medioambiental de Munda Wanga en Zambia. Emma Stone, ex_gerente de educación, describe el desarrollo del programa educativo del Parque que florece gracias al apoyo económico de colaboradores como el Zoo de Chester, RU, y el Zoo del Bronx ,

than 1,000 students who have studied at the International Training Centre at Jersey Zoo. With the Convention on Biological Diversity stressing the need for an ecosystem approach to biodiversity conservation, perhaps the time has come for us to set up an International Diploma Course in Zoo and Botanic Garden Education? Certainly capacity building has been central to the success of the Munda Wanga Environmental Park in Zambia. Emma Stone, former Education Manager, describes the development of the education programme at the Park which is blossoming, thanks to the expertise and financial support of collaborators such as Chester Zoo, UK, and Bronx Zoo, USA. As well as trained educators and a comprehensive education programme, the Park also boasts a well-stocked library, two education rooms, an interpretation room and an education office. Emma's article is testimony to the amazing work that can be achieved through partnerships.

It is apparent that there is a significant interest by zoo educators in incorporating plants into their education programmes. To give readers a taste of how this is being done we have included several case studies that confirm the thematic congruence of thinking that is being carried out in gardens and zoos. Conversely, we ask whether botanic gardens should keep animals as exhibits. The response from botanic garden educators throws up a range of practical and ethical issues and indicates that we have much to learn from our zoo colleagues. This issue of Roots emphasises the importance of sharing information and expertise. There is no doubt that, through working together, zoos and botanic gardens can be an even stronger force for biodiversity conservation,

Wanga Environmental Park en Zambie. Emma Stone, ancienne Directrice du Service Educatif, décrit le développement du programme éducatif du Parc qui prospère grâce à l'expertise et à l'aide financière de collaborateurs tels que le Zoo de Chester au Royaume Uni et au Zoo du Bronx aux Etats-Unis. Le Parc n'est pas peu fier de ses animateurs compétents comme de ses programmes éducatifs clairs ainsi que de sa bibliothèque bien fournie, ses deux salles pour les activités éducatives, sa salle d'interprétation et de son bureau pour les animateurs. L'article d'Emma est le témoignage de l'incroyable travail qui peut être réalisé avec de bons partenariats.

Apparemment, il semble avoir un réel intérêt de la part des animateurs des zoos d'intégrer le monde végétal dans leurs programmes éducatifs. Pour donner à nos lecteurs un avant-goût de ce qu'il serait possible de réaliser, nous abordons quelques cas concrets. Tous confirment ce qu'il y a en commun dans les thématiques des jardins et des zoos qui peuvent et qui sont explorés. Réciproquement, nous posons également la question de savoir si les Jardins Botaniques doivent exhiber des animaux. Comme vous allez pouvoir le lire, la réponse des animateurs des Jardins Botaniques soulève une série de problèmes pratiques et éthiques et indique que nous avons beaucoup à apprendre de nos collègues des zoos. Ce numéro de Roots met l'accent sur l'importance de partager l'information et les analyses. Il n'y a pas de doute qu'en apprenant à travailler ensemble, Zoos et Jardins Botaniques pourraient constituer un groupe encore plus efficace en faveur de la conservation de la biodiversité.



EEUU. Además de experimentados educadores y de su completo programa de educación, el parque se enorgullece de una bien provista biblioteca, dos aulas educativas, una para la interpretación y oficina. El artículo de Emma testimonia los admirables logros que se pueden alcanzar con la cooperación.

Verdaderamente hay un significativo interes de los educadores de zoos por incorporar las plantas en sus programas educativos. Para dar a los lectores una prueba de cómo se viene haciendo, hemos incorporado varios ejemplos. Todos confirman la similitud de temas que jardines y zoos están explorando. Inversamente, nos preguntamos si los JJBB deberían exhibir animales. Como podreis leer, las respuestas de los educadores de JJBB implican cuestiones éticas y prácticas que resaltan la importancia de compartir información y profesionalidad con nuestros colegas de los Zoos. Como subraya este número de Roots no hay duda de que, trabajando juntos, los JJBB y Zoos pueden ser una fuerza más potente en la conservación de la biodiversidad.

De la ménagerie au plan d'ensemble détaillé: connecter les jardins botaniques avec les zoos

De colecciones de fieras a planes maestros: vinculando lo botánico con lo zoológico

John Arnott

From menageries to masterplans linking the botanical with the zoological

Summary Zoological gardens proliferated in the western world throughout the 19th Century. Many demonstrated what we would today consider inadequate conditions. Shifting public opinion post the 1960s forced changes to the role of zoos that ultimately led them to becoming centres for animal conservation, research and environmental education.

The approach was one of 'habitat immersion' through the development of naturalistic exhibits that attempted to simulate or represent the physical and biological elements of an ecosystem. The extension of the naturalistic exhibit has been the move towards the Biopark. The term Biopark refers to an institution which amalgamates the plant curation and display of a botanic garden, the zoology and wildlife display of a zoo and the exhibition of artefacts and objects, together with study and interpretation which one would normally associate with a museum.

This paper discusses the evolution of zoos, and complimentary relationship between zoos and botanic gardens as life science institutions committed to the principles of environmental education with a strong ecological and social emphasis.

Left: Basalt Plains Exhibit Open Range Zoo (Photo: Werribee Open Range Zoo: Richard Rowe)

Our fascination with wildlife has expressed itself in people keeping animals in captivity for centuries. In 1000 BC, Chinese emperor Wen Wang founded the Garden of Intelligence, which housed a collection of exotic animals in extensive park-like surroundings. The 'Garden of Intelligence' reference alludes to the educational potential of zoos even in their earliest form.

These gardens were usually situated in park-like or wooded settings however, it would appear that there was no attempt to integrate the flora and fauna beyond an attractive setting. Indeed it was not until Louis XIV of France deliberately planted trees, shrubs, and flowers around and between the cages of his menagerie to conceal the ugly bars and fences that horticulture began to take on a special role in the zoo. During the French Revolution, botanists at the famous Jardin des Plantes in Paris begrudgingly accepted Louis' menagerie for safekeeping. Thus, in 1793, the Menagerie du Jardin des Plantes became the first public zoological garden in the western world (Moore 1999).

Zoological gardens proliferated in the western world throughout the 19th Century, often supporting the role of the acclimatisation societies and the introduction of useful domestic and ornamental species. The menageries of the 19th Century demonstrated what we would today consider inadequate conditions. The animal's natural habitat and behaviour were not fully understood or taken into consideration when exhibits were designed and constructed. As cleaning was the primary concern, enclosures were typically concrete floored and lacked any natural vegetation. Visitors viewed the animals while strolling through

landscaped gardens that often consisted of sweeping lawns, ornamental lakes, specimen plants and bedding displays. The emphasis was on leisure and recreation and the novelty of seeing exotic and dangerous animals.

There was however a notable exception with the lavish European landscape approach of Carl Hagenbeck, a German zoologist and animal dealer. In 1907, Hagenbeck revolutionized the approach to zoo exhibit design by building his radically new 'Tierpark' (Animal Park) on the outskirts of Hamburg. His zoo was based on the concept of barless, moated exhibits. Hagenbeck's innovative style also attempted to display animals in their naturally occurring social groups rather than the more typical 'postage-stamp' collections of one or two animals (Moore op. cit). The Hagenbeck approach was perhaps unique and not widely emulated across the world's zoos. Indeed through the first half of the 20th century the approach of many zoos to exhibit design was purely functional. There were few attempts at creating stimulating enclosures for the captive animals or to develop integrated displays with horticultural or botanical components.

Shifting public opinion during the 1960s which gained in momentum during the 1970s and 80s, forced changes to the role of zoos that has ultimately led them to becoming centres for animal conservation, research, environmental education as well as continuing to be major tourist attractions. In line with such developments the zoo industry undertook something of a metamorphosis in the 1970s and 1980s. In Seattle landscape architects Jones and Jones *et al* reapplied the landscape approach of Hagenbeck to modern zoo designs. John Coe's 'Design and Perception: Making the Zoo Experience Real' remains a watershed in the evolution of the zoo exhibit. The broad principals associated with this document are still relevant to exhibit design (Coe, 1985).

The approach was one of 'habitat immersion' through the development of naturalistic exhibits, spaces that attempted to simulate or represent the physical and biological elements of an ecosystem. Perhaps the most notable example of an institution which totally embraced the approach was the Arizona-Sonora Desert Museum, USA. Under the directorship of David Hancocks, the Desert Museum was years ahead of its time and a model much emulated by zoos and wildlife parks worldwide.

Displaying animals in naturalistic exhibits with a clear focus on habitat representation provides zoos with the opportunity to demonstrate the often-complex interrelationships between plants, animals and their environment. This allows for the potential for interpretation and public education and provides an exhibit environment to better cater for the range of social, behavioural and psychological needs of different animal species.

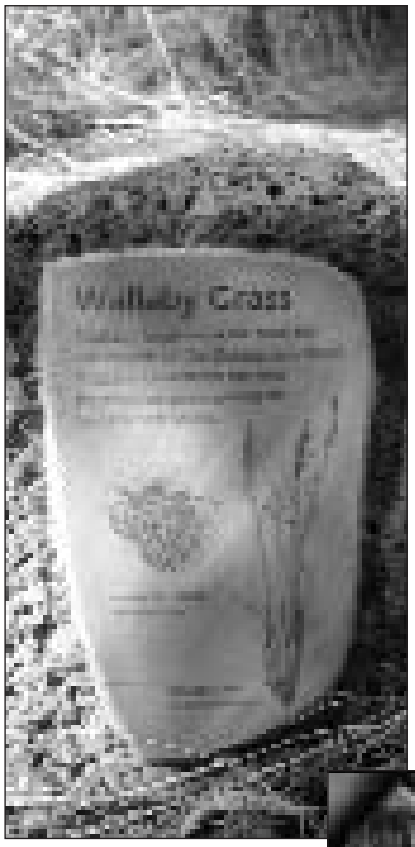
It is into this environment that a zoo visitor enters. It is a powerful method of display that highlights the interaction between plants and animals and can alter the perception that visitors have of the animals and plants.

A study in the 1990's at Melbourne Zoo in Australia highlighted the effect this type of exhibit has on visitors and its ability to engender positive attitudes toward plants and animals. This research examined visitor perception of Western Lowland Gorillas at Melbourne Zoo in a newly constructed naturalistic exhibit in contrast to the old pit style exhibit. When school children aged between 10 and 15 were asked what the threats to the gorillas might be in the wild, the common response in the old enclosure was poaching, shooting and hunting. Asked the same question about gorillas in the naturalistic exhibit and the responses were was markedly different. The overwhelming response was that gorillas are threatened by loss of habitat.

A change in the visitor perception of the gorillas themselves was also evident. In the old enclosure the gorillas were referred to as ugly, stupid, angry, aggressive; all negative reactions. When asked about the same individual gorillas in the naturalistic exhibit the changes in responses were quite startling. They were perceived as being gentle, social and intelligent animals.

The results of these two studies support the importance and inherent values of immersion. An exhibit display that combines elements of flora, fauna and landscape provides zoo visitors with a genuine opportunity to make quite profound links and clearly demonstrates the educational potential

Right: Habitat immersion exhibits engender positive attitudes towards plants and animals (Photo: Zoological Parks and Gardens)



Left: Interpretation at the Werribee Open Range Zoo (Photo: Werribee Open Range Zoo: Richard Rowe)

for modern zoos. Broadly speaking naturalistic exhibits and the principals of habitat or landscape immersion are now almost universally considered to be the tools to aid in the delivery of educational objectives for zoos.

Left: The Sumatran tiger exhibit in Melbourne Zoo provides an excellent example of the habitat immersion experience (Photo: Zoological Parks and Gardens)

In recent times there has been a trend for zoos to incorporate botanic displays into their programs and landscapes. These initiatives have been developed along the same principals as the naturalistic animal exhibit, highlighting issues of habitat, conservation, environmental education and so on. But generally speaking with garden displays a more focused or higher level of botanic integrity and accuracy is possible due in the main to the absence of pressures from the resident animals! Today there is a trend in zoos to actively adopt botanical collections planning and policy to assist in the management of their botanic collections.

The Volcanic Plains Exhibit at Werribee Open Range Zoo in South East Australia provides an interesting case study. The Volcanic Plains Exhibit displays over 200 native grassland plant species from this region. Surveys suggest that visitors leaving this display have taken with them a positive impression of the volcanic plains grassland. This habitat once occupied 20,000 square kilometres of Western Victoria and was referred to as 'Australia Felix – favoured part of Australia' by Major Thomas Mitchell an early explorer to the region. Habitat destruction has reduced this ecosystem to less than 1% of its original range. These grassy ecosystems today support 31% of the state of Victoria's endangered plant species (Lunt et al, 1998). The fragmented remnants often occur on land zoned for industry, housing or other developments and need to compete with these interests for their existence. Grasslands suffer from a poor public perception and are often referred to as being snake infested, weedy fire hazards. The Volcanic Plains Exhibit puts into context many of these elements and helps to dispel such myths. Issues such as fire can also be tackled through its use as a landscape management tool (Australian Government Department of Environmental and Heritage, 2004).

The Alice Springs Desert Park in Central Australia is perhaps the best example of a life science institution, which aims to completely integrate botanical elements into its design philosophy and displays. The Park was designed to move well beyond the boundaries of traditional zoos, botanic gardens and museums and has adopted a holistic 'habitat-based and story driven' approach to display and interpret the Australian desert in its entirety; the landscapes, animals and plants, and their traditional use and management by Aboriginal peoples. This has been recognised by experts in the field including Sir David Attenborough who claimed 'There is no museum or wildlife park in the world that could match it'.

The development of the Alice Springs Desert Park heralded the next significant trend in zoo design and interpretation through integrating cultural interpretation into the experience. Strongly associating people and the fundamental relationship humans have with the local and global environment has allowed for interpretation and educational programs to be structured as education **for** the environment, rather than education **about** the environment.

The Alice Springs Desert Park can appropriately lay claim to being one of the world's great bioparks, a term which was first used by Michael Robinson in 1984 when considering the strategic direction for the National Zoological Park in Washington (Robinson, 1993).

The Biopark approach is the logical extension of naturalistic exhibits for zoos and natural history institutions worldwide. In essence, the biopark refers to an institution which amalgamates the plant curation, exhibition and display of a botanic garden, the zoology and wildlife display of a zoo or wildlife park and the exhibition of artefacts and objects, together with study and interpretation which one would normally associate with a museum.

The Biopark approach was discussed in detail in a parallel session of the World Botanic Gardens Congress in Barcelona earlier this year. Mark Richardson (Director, Asia and Middle East Program BGCI), who was instrumental in setting up the Alice Springs Desert Park, facilitated the session.

The session discussed the differences between zoos and botanic gardens but importantly it explored and highlighted the synergies and the complementary relationship between these institutions.

The key discussion points from this session were:

- the amalgamation of botanic gardens and zoological displays which are based on ecological principles are a logical progression to effective natural history displays
- there is a need to encourage common work and activities between zoological and botanical staff to achieve good links
- the work that the botanical/horticultural staff of many zoos are currently doing demonstrates that zoos are already contributing to the goals of the Global Strategy for Plant Conservation and the registration of zoos for the International Agenda should be encouraged
- there are many common links between the educational programs associated with zoos to the work that botanic gardens are facilitating.

Perhaps zoos, with their charismatic animals that serve to fascinate and inspire, their strong ecological emphasis and underpinning focus on wildlife habitats, have an enhanced opportunity to deliver clear environmental messages to a broad cross section of the community.

Equally, botanic gardens are increasingly delivering an ecological message through plant displays, exhibits, and collections, discussing the fundamental relationship between plants and people and have broadened their interpretation and education programs to discuss interdependency, ecosystems, and conservation.

The biopark model may well be the ideal, but for many established institutions an impossibility. However the shared principles of environmental education with a strong ecological and social emphasis, ensure an enduring and complementary relationship between zoos and botanic gardens.

References

- Moore, M. (1999) *Zoological Horticulture – A Vital Element in Exhibit Design for the New Millennium, Brazilian Congress lecture*, Association of Zoological Horticulture, USA
- Coe, J. (1985) *Design and Perception, Making the Zoo Experience Real*, Zoo Biology, USA
- Lunt, I. Barlow, T. Ross, J. (1998) *Plains Wandering: Exploring the Grassy Plains of South Eastern Australia*, National Parks Association, Australia
- Australian Government, Department of the Environment and Heritage. (2004) *Case Study: Grassland Restoration at the Victorian Open Range Zoo*. www.deh.gov.au/land/publications/zoo/index.html
- Robinson, M. (1993) *The Age of the Biopark*, The World and I, Natural Science, Article Number 11303, www.worldandicollege.com

Résumé

Les Jardins Zoologiques ont proliféré dans le monde occidental pendant le 19eme siècle. Un grand nombre fournissait des conditions d'élevage que l'on considèrerai comme inadéquates aujourd'hui. L'évolution de l'opinion publique depuis les années 1960 a obligé à revoir le rôle des zoos et les a finalement conduits à devenir des centres pour la conservation des animaux, la recherche et l'Education à l'Environnement.

Une des approches fut celle de « l'immersion dans l'habitat », par le développement de reconstitutions de milieux naturels qui tentaient de simuler ou de représenter les éléments physiques et biologiques d'un écosystème. Par extension, les reconstitutions naturelles ont évoluées vers la notion de Bioparcs. Le terme de Bioparc se réfère à une institution qui amalgame la présentation de végétaux, comme dans un jardin botanique, la présentation d'animaux sauvages, comme dans un zoo, et la présentation d'objets et de fac-similés avec les notions d'étude et d'interprétation qui sont normalement associées aux musées.

Cet article traite de l'évolution des zoos et les relations complémentaires entre les zoos et les jardins botaniques comme institutions de sciences de la vie, attachées aux principes de l'Education à l'Environnement avec un fort accent mis sur l'écologie et le social.

Resumen

Los zoológicos proliferaron en los países de occidente durante el siglo XIX. Muchos de ellos mostraban lo que hoy en día consideramos condiciones inadecuadas. El cambio externado por la opinión pública a partir de los 60's obligó a los zoológicos a cambiar sus objetivos transformándolos en centros de conservación e investigación animal y de educación ambiental.

Una de las aproximaciones de este cambio fue la de "simulación del habitat" mediante el desarrollo de exhibiciones naturalistas que imitan o representan los elementos físicos y biológicos de un ecosistema. La extensión de la exhibición naturalista es lo que ha promovido el desarrollo del Bioparque. El término Bioparque se refiere a una institución que integra la curación de plantas de un jardín botánico, los aspectos zoológicos y de vida silvestre de un zoológico y la exhibición de artefactos y objetos, junto con la investigación e interpretación asociada normalmente a museos.
Este artículo se centra en la discusión de la evolución de los zoológicos, y la relación complementaria entre zoológicos y jardines botánicos como instituciones científicas vivas comprometidas con los principios de la educación ambiental con un fuerte componente ecológico y social.

John Arnott is the Curator of Geelong Botanic Gardens, PO Box 104, Geelong 3220, Australia. Tel: (03) 5227 0387. Fax: 0408408157. Email: jarnott@geelongcity.vic.gov.au

Catherine Hubbard

Taking a holistic approach to environmental education

Left: 'Adaptation' is a common theme in programs at all three BioPark facilities. This garden docent is teaching about the adaptations of seeds at the Rio Grande Botanic Garden's Children's Seed Festival. (Photo: Allyson Wallace)

Summary The concept of a 'biopark' is still relatively new, and was implemented in 1996 in Albuquerque, USA - New Mexico's largest city. The Albuquerque BioPark consists of a zoo, aquarium and botanic garden. It is administered as one governmental facility by the City of Albuquerque, with one director, shared staff, and a shared mission. The zoo is located at one site, and the aquarium and botanic garden are adjoining at another location, one mile away. Each venue attracts its own audience, and has its own identity. Yet, by linking exhibits and taking a holistic approach to the same basic conservation themes throughout the BioPark, each venue reinforces the others. Different perspectives of nature can be explored depending on the type of display, but all exhibits illustrate biodiversity. This article addresses the benefits and challenges of integrating various education programs at all three sites into one BioPark education system. Summer day camps, lecture series, special educational annual events, volunteers, hands-on demonstrations, teacher workshops, outreach, community networking and other aspects of educational programming are evolving at the BioPark in ways to maximize the close connections between the zoo, aquarium and botanic garden.

Working together as one system in nature, each plant and animal has an important role to play in maintaining an ecological balance. The interdependence of all living organisms ensures the biodiversity necessary for the survival of the planet. Effectively communicating the critical concept of biodiversity is one of the educational challenges that botanic gardens face, along with zoos and aquariums. At Albuquerque BioPark each of the three sites works towards a common purpose, using their living collections to engage their audiences. When strategies and resources are combined, the benefits outweigh the challenges. Plants are the basis of life, but animals often get more of the public's attention. If botanic gardens collaborate with zoos and aquariums, visitors will receive a more comprehensive view of life on earth. At the BioPark, the zoo, aquarium and botanic garden do more than collaborate, they operate as a system that is a regional attraction for almost a million visitors a year.

The Rio Grande Zoo, Albuquerque Aquarium and Rio Grande Botanic Garden are existing components of the Albuquerque BioPark, and will soon be joined by Tingley Aquatic Park (consisting of several ponds and acres of land adjacent to the Rio Grande riparian forest). The 280-acre BioPark is administered as one integrated facility by the City of Albuquerque, with one director, shared staff and a shared mission. The Rio Grande Zoo was founded in 1927 and is the most established component of the BioPark. The Rio Grande Botanic Garden and Albuquerque Aquarium opened in 1996, a result of a quality of life tax assessed by the City in the late 1980s. The botanic garden and aquarium share an adjoining plaza, located one mile from the zoo. Within a year, Tingley Aquatic Park will open along with a train (3/4 scale) to physically connect the zoo with the botanic garden and aquarium.

Right: Young visitors enjoy identifying butterflies in the Butterfly Pavilion at the Rio Grande Botanic Garden (Photo: Chuck Weed)

The BioPark is the number one tourist attraction in the state of New Mexico. New exhibits and special events are continually being added at one or more of the components to maintain a high level of community interest. A successful visit at one component reflects positively on the other components. As mentioned, we report to one director and share staff and departments such as graphics, marketing, budget, concessions and education. This ensures a consistency in operations. A conscious effort is made, for instance, to equally promote all three components and market the BioPark to the surrounding cities and states. The horticulture team designs, plants and maintains the grounds at the zoo as well as the botanic garden, so both places are a rich botanical experience. We offer a combination ticket price as well as admission just for the zoo or just for the garden and aquarium since each has the potential to attract different audiences with different interests. Frequently, however, visitors arrive intending to visit just one setting and end up seeing all three. This audience cross-over has both fiscal and educational benefits.

For the education staff at the BioPark, the educational advantages of taking a holistic approach to conservation offers the most compelling reason to function as one facility. It can be challenging to maintain a strong identity as a garden, an aquarium, and a zoo while also functioning as a team within one integrated facility. However, the education staff work to maximize the natural connections among all three settings and staff, volunteers, programs and interpretation all support the same education mission 'to teach about interdependence and the diversity of life while inspiring a sense of stewardship for our natural world'. The education department has a BioPark curator of education who works at all three settings and divides her time among them. There are two education coordinators that report to her, one based at the garden/aquarium and one based at the zoo. The education coordinators have their own support staff, and teachers who assist with site-specific programs and volunteers. There are also educational staff members responsible for programming for all three settings, and these may be based at either site - for example, outreach staff and the performing arts facilitator. The education staff stay connected by, for example, alternating sites for team meetings, frequently communicating with each other to avoid scheduling conflicts and staying informed.

Volunteers are especially important for the delivery of education at the BioPark. Efforts are made to recruit adult and teen volunteers through the usual mass-market outlets such as the newspaper, radio and television. We also post information at locations where we will find specific target groups, such as at plant nurseries, vet clinics, or dive shops. Over 10 different jobs are offered at different times of the year, but the recruitment and training occur at the same time for each job. For instance, all docents are recruited in the late summer, and are trained in the fall to work at the zoo, garden or aquarium. While, most of the training days are site-specific, several are the same covering general ecology topics. An option is also available to train simultaneously for two of the sites as a docent. Some volunteer jobs follow a similar training procedure, while other jobs are only available at one of the sites (e.g., working at the garden railroad, staffing the touch pool). Depending on the job, once trained, volunteers can choose to weed in the botanic garden or at the zoo, teach at any of the settings, or alternate locations where they want to greet visitors on a daily basis. Determining an equitable system of recognition for all the volunteer jobs has proven to be complex and challenging, and has evolved each year, but volunteers are patient as changes are made. The range of volunteer jobs and sites available is viewed as an asset for some volunteers, while others choose to specialize in certain areas and remain there for their career at the BioPark. Regardless of where they work or what they do, efforts are made to make the volunteers realize their worth to the BioPark and enhance the visitor's experience.

Programs are a focus for over 300,000 people a year at the BioPark. Local and state-wide outreach, camps, teacher workshops, pre-school classes, tours, on-site exhibit interpretation, monthly lectures and special educational events are a sample of the offerings that happen at the zoo, garden and aquarium. Most happen at more than one site, and the format is similar through out the BioPark for each of the individual programs. Some programs alternate locations on a weekly basis, other programs alternate daily, and some programs happen simultaneously at different settings to create more synergy. Throughout the summer, eight camps are offered that cover general concepts such as habitats, adaptations, biodiversity, and endangered species as well as topics more specific to each setting. Two of the camps are held at the zoo; two at the garden; two at the aquarium. Two camps alternate locations throughout the week, allowing the children to sample the entire scope of the BioPark. The difficulty with this arrangement is communicating successfully with the parents on where to pick up or drop off their child, but the evaluations conducted at the end of the week provide evidence that the parents feel it is worth it. For special educational events, they may happen simultaneously at all three settings (i.e., the week long Conservation Arts Festival which features different activities at each site) or one day of a weekend may feature activities at the garden and the next day the activities are at the zoo, like the format adopted for International Migratory Bird Day. Over the years, an idea for a special event may start at one setting (e.g., Winter Wool Festival began at the zoo as it related to alpacas and llamas) and soon involve another setting (now the Festival is also at the garden and the focus is on plant dyes for wool). By establishing an underlying pattern to

each program and using similar visuals and terminology, we attempt to reinforce the same basic conservation messages.

In Albuquerque, we're fortunate to have a park that encompasses a zoo, botanic garden, and aquarium and the role each has in communicating our environmental education message is enhanced when teamed with the other settings. Increasing our visitors' awareness and understanding of plants will lead them to recognize their value more, no matter where they learn it: garden, zoo or aquarium.

Résumé

Le concept de « bioparc » est encore relativement récent et a été mis en place en 1996 à Albuquerque, Etats-Unis, la plus grande ville du Nouveau Mexique. « L'Albuquerque BioPark » est constitué d'un zoo, d'un aquarium et d'un jardin botanique. Il est administré comme une structure publique unique par la ville d'Albuquerque, avec un directeur, un personnel et des missions communes. Le zoo est sur un site, à environ 1,5 km de l'aquarium et du jardin botanique qui sont côte à côte. Chaque lieu attire un public particulier et a sa propre identité. Cependant, en liant les expositions et avec une approche holistique des mêmes thèmes de base sur la conservation dans tout le BioPark, chaque lieu renforce le message de l'autre. Selon le type de présentation, différents points de vue sur la nature peuvent être explorés mais tous illustrent la biodiversité. Cet article traite des avantages et des défis pour intégrer les divers projets éducatifs des trois sites en un système éducatif au BioPark. Les stages d'été, les programmes de conférences, les manifestations annuelles, les bénévoles, les démonstrations pratiques, les ateliers pour enseignants, les activités sociales et la mise en réseau au niveau local, ainsi que d'autres aspects de la programmation pédagogique évoluent au BioPark pour optimiser les connections entre le zoo, l'aquarium et le jardin botanique.

Left: The child in this photo is learning about a Prehensile Tailed Porcupine from a docent at the Rio Grande Zoo. (Photo: Deborah Green)

Resumen

El concepto del "Bio-parque" que fue implementado en 1996 en Albuquerque, EU, es aun relativamente nuevo. El Bio-Parque de Alburqueque consiste de un zoológico, acuario y jardín botanico. Es administrado como una facilidad gubernamental por la ciudad de Alburqueque, con un solo director, un mismo personal, y una misión común. El zoológico está situado en una localidad distinta al acuario y al jardín botánico los cuales están a una milla (1,6 kilometros) uno de otro. Cada entidad atrae a su propio público y tiene su propia identidad. Pero se interlazan las exposiciones y hay una consideración holística de los temas de conservación que son comunes en todo el Bio-parque, y así cada local refuerza los mensajes de los otros dos. Los diferentes aspectos de la naturaleza pueden explorarse de diferentes maneras dependiendo en el tipo de exposición, pero todo lo expuesto ilustra la biodiversidad. Este artículo hace referencia a los beneficios que dan y a los retos que presentan la integración de los diferentes programas educativos de las tres localidades dentro de un sistema de educación para el Bio-parque. Los campamentos de verano, las series de charlas, los eventos anuales especiales, los voluntariados, las demonstraciones prácticas, los talleres de profesores, la promoción, el networking con la comunidad, y otros aspectos de la programación educativa, se desarrollan en el Bio-parque de una manera que se benefician lo mas posible de la cercana relación entre el zoológico, el acuario y el botánico.

Catherine Hubbard is the Acting Manager for Rio Grande Botanic Garden and BioPark Education Curator.
Albuquerque Biopark
903 Tenth Street SW
Albuquerque, NM 87102
Phone: (505) 764-6200
Fax: (505) 848-7192
Emaiil: CHubbard@cabq.gov
www.cabq.gov/biopark/garden/

Plant education in ZOOS

Summary Plants and animals are inextricably linked. Plants provide animals with food, medicine and shelter, while animals assist plants in pollination, germination and moving from one place to another! Encouraging visitors to zoos and gardens to make these links is essential. They can learn about the importance of ecosystems, their fragility and how they themselves are connected to the global ecosystem. Increasingly zoos are recognising the importance of developing education programmes that embrace both animals and plants. The following case studies provide us with a sample of the programmes on offer.

Building an interest in plants and animals

Belo Horizonte Zoo and Botanic Foundation is located in the state capital of Minas Gerais, Brazil. Its educational purpose is based on the understanding that environmental education is a continuous process.

Right: Children taking part in the education programme at the Belo Horizonte Zoo and Botanic Foundation. (Photo: Belo Horizonte Zoo and Botanic Foundation)

It is not the Foundation's intention for visitors to become 'experts' in plants or animals. It believes that information and experience can lead to satisfaction, curiosity and a feeling of wanting to know more about the world in which we live.

Weekend visitors to the zoo and botanic gardens do not necessarily want to learn something about animals or plants. They come to admire, observe and entertain themselves. Through observation, questions, reflexions and theories can be elaborated and developed by visitors according to their intellectual level. The Zoo and Botanic Foundation builds on this to promote a greater interest in plants, animals and the inter-relationship among them and human-beings.

The Foundation interacts with its visitors in different ways. There are signs containing information about plants and animals, educational activities, plays, talks about the life and curiosities of plants and animals and exhibitions highlighting the relationship between humans and nature. The social role of the zoo and botanic gardens cannot be underestimated. Visiting the Foundation, as well as similar institutions, is a starting point for future learning. There is much to do to make these places better used as environmental and cultural educational spaces. They are an extremely important part of education and are essential in forming individuals who recognize themselves as an important piece of the global ecological jigsaw.

Liliane Evangelista, Fundacao Zoo-Botanico de Belo Horizonte, Av. Otacilio Negrao de Lima 8000, 31.365-450 BELO HORIZONTE-MG, Brazil. Email: lhelena@pbh.gov.br

Top left: Pandas are one of the charismatic species at San Diego Zoo

Bottom left: Watching animal behaviour is part of the educational experience at San Diego Zoo

Top right: Face to face with a close cousin at San Diego Zoo.

Bottom right: A porcupine and its eponymous palm demonstrate the similarities in their adaptation.

(Photos: San Diego Zoo)

The REAL reason to visit the zoo

Got pandas? Got koalas? Got giraffes? You better have plenty of bamboo, eucalyptus and acacia!

Most people expect the world famous San Diego Zoo to have a world-class collection of exotic animal species, but visitors are often delighted by our equally impressive exotic plant collection.

The botanical collection's purpose is multifaceted. Plants are used as functional landscaping, providing a beautiful, natural setting for our animal exhibits, which then opens a window to the habitat of the world. The plants are an important renewable food source for many of the zoo's herbivorous species. Horticulture staff harvest bamboo, acacia, ficus, hibiscus and banana just to name a few browse plants. These materials help provide high quality nutrition which is vital for animal health. Plant material is also harvested for our Animal Enrichment program. Banana stalks become a play tool for an elephant, timber bamboo might be a 'puzzle feeder' used to hide treats for a panda.

Connecting people to wildlife and conservation is a vitally important mission of the Zoological Society of San Diego. With all the zoo's unusual uses for plants, and the extensive collection, the zoo is a paradise of educational resources.

In the past five years, the Education Department in concert with the Horticulture Department has created several 'teaching gardens'– a large butterfly garden and a childrens' vegetable garden complete with a pond. These gardens have been certified by the National Wildlife Federation as School Yard Wildlife Habitats. Monarch butterflies often stop by on their migrating and a pair of wood ducks were found in the pond this past spring! The gardens are used for educational programs for children as young as three through to adult participants. Spending time in the gardens helps children learn to nurture and respect life. Gardening helps children make the connection to their own food through hands-on experience. Learning about animal diets comes alive in a garden setting. The beauty of these gardens provides welcome stress-relief for our employees.

Plants are vital to the survival of species. Learning about the mysteries of the plant world opens the eyes of our zoo visitors to the amazing diversity of life on planet Earth.

Laurie Furry, Education Specialist, San Diego Zoo, P.O. Box 120551, San Diego, CA 92112-0551. Email: L.Furry@sandiegozoo.org

ZooBot adventures: a unique collaboration

Tucson residents were having a tough time deciding between summer camp at the Zoo or the Botanical Gardens. Now they can do both! Kids discover the connections between plants and animals at **ZooBot Camp**. This five-day adventure offers an in-depth exploration of animals and plants that revolves around FUN! Participants spend the mornings at the Zoo immersed in behind-the-scenes adventures, art projects, science experiments and more. Then they head to the Tucson Botanical Gardens for afternoons of botanical discovery. Kids bring a sack lunch each day, but snacks that reinforce the day's theme are provided.

Below: A junior keeper helps out at feeding time at Reid Park Zoo (Photo: Reid Park Zoo)

Top right: View over one of the planted areas of Newquay Zoo (Photo: Michelle Turton)

Right: Mark Norris attired for one of the plant explorers sessions at Newquay Zoo (Photo: Michelle Turton)

Children are dropped off at the Zoo in the morning and picked up at the Botanical Gardens in the afternoon. Reid Park Zoo provides transportation between locations, while the Botanical Gardens provides registration support. Members of each institution typically fill the sold-out camps each year. The revenue for the camp is shared and each institution plans its own activities and budget. This mutually beneficial arrangement has been in place for several years and improves with each season! Although both institutions offer individual full-day camps, this programs remains the most popular selection and sells out early.

Vivian VanPeenen, Curator of Education, Reid Park Zoo, 1100 S. Randolph Way, Tucson, AZ 85716. Tel: (520) 791-3204 x 12. Email: Vivian.vanpeenen@tucsonaz.gov

Highlighting the links between plants and animals

Newquay Zoo is located in the UK's West Country which boasts a heritage of historic gardens, maritime connections and plant hunters. This horticultural link and the presence of the Eden Project nearby brings many visitors (especially older visitors with an interest in gardening) to Cornwall. For this reason, the Zoo has developed talks and signage that highlight the links between the animal collection and plants.

Right: One of the plant-based exhibits at Newquay Zoo (Photo: Michelle Turton)

Far right: Interpretation for a tree fern at Newquay Zoo (Photo: Michelle Turton)

We are fortunate to have an informal working partnership called EPIC (Education Providers in Cornwall) which links the education officers in museums, galleries, gardens, heritage sites, zoos and wildlife organisations in Cornwall. Through meetings and email groups, EPIC helps to promote events and joint projects, share training and provides a good source of specialist information as required.

As a result, Newquay's formal and informal education programme now includes many themes that highlight the links between plants and animals:

- homeopathy, herbal remedies and 'bush medicine' practiced by people and animals linked to our Wildlife Hospital and herb baskets;
- native species and wild areas of the zoo for birds, bats and beetles;
- bio geographic regions or zones of animals with relevant plantings;
- similar adaptations e.g. spines and poisons between porcupines and cacti, arrow poison frogs and toxic plant sap

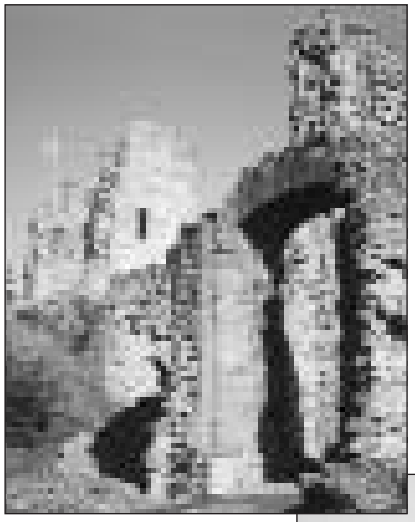
- invaders from overseas: introduced animals whether African Land Snails or Japanese Knotweed
- evolution and survival, looking at extinct, endangered and surviving 'living fossils' within the plant and animal world (i.e. the 'Jurassic Bark' effect of how to make tree ferns and cockroaches exciting by mentioning dinosaurs)
- the shared history element: explorers, plant hunters and multicultural aspects of different societies (folklore, medicine etc.)
- threatened habitats, their wildlife and plants such as the rainforest area in our atmospheric Tropical House.

Mark Norris, Head of Education, Newquay Zoo, Trenance Gardens, Newquay, Cornwall, TR7 2TW, UK. Tel: 01637 873342. Fax: 01637 851318. Email: info@newquayzoo.org.uk. www.newquayzoo.co.uk

Using Plants to Engage the Senses

Dudley Zoological Gardens, established in 1937, surrounds the ruins of Dudley Castle founded in 1070. Over the years, the Zoo has undergone many changes. The majority of the grounds were laid out as informal gardens and animal enclosure borders, along with the existing native woodland and well-established trees on site. In 2004 an area in the Castle outer defences, previously the 'Pets Corner' of the Zoo, was cleared and planted as a Sensory Garden. The aim is to provide an enjoyable experience for visitors of all ages and abilities, highlighting the diversity of plants, their importance to people and wildlife, and their uses over the years.

The Garden is situated in an area with a good view of the Castle keep, the defensive bank, and some animal exhibits. It has a range of raised beds,



Top left: The zoo grounds are based around Dudley Castle

Left: The new sensory gardens adds another dimension to Dudley Zoo

(Photos: Dudley Zoo)

including alpines and heathers, mixed herbaceous area, Japanese acer border, and herbs. Species are chosen to provide stimulation of the senses of touch, smell, and sight. Hearing is stimulated through wind-chimes, native birds, a small water feature and wind moving through plants. The opportunity to taste plant-derived products is currently being investigated and some sculptures that people can touch will be added to the experience.

The Sensory Garden will enable visitors to learn about composting and recycling and how to encourage insect life in the garden. Interpretation panels will provide information, and it is planned to include the area in the Zoo's newly developed public talks programmes.

Stephen Woollard, Head of Education, Dudley Zoological Gardens, 2 The Broadway, Dudley DY1 4QB. Tel: (01384) 215 317. Email: www.dudleyzoo.org.uk

Talking plants

During the summer of 2003, Chester Zoo, UK, held a series of talks entitled 'Talking Plants'. The talks took place at various points around the Zoo at specific times and were meant to be both entertaining and informative for visitors.

The interrelationship between animals and plants was, maybe, an obvious topic but the talks covered a variety of issues. Conservation of water was tackled by explaining how the water from the elephant pool is recycled using a reedbed. The life history of the Brazil nut tree was used to explain the intricacies of life in the rainforest as well as highlight the Forestry Stewardship Campaign (FSC). Topics such as genetically modified foods and the conservation of wild strains of plants were incorporated into talks looking at the many uses of plants (ancient and modern). Even the past exploitation of plant material was covered during a talk entitled 'Plant Hunting'.

Many of these topics were also covered in the 2004 talks. However, one completely new talk entitled 'Alien Invasion' looks at the problems associated with invasive plants and animals.

Liz Marrs, Presenter, Chester Zoo, Upton-by-Chester, Chester CH2 1LH. Tel: 01244 380 280. Fax: 01244 371 273. Email: www.chesterzoo.org

Résumé

Les plantes et les animaux sont inextricablement liés. Les plantes fournissent aux animaux leur nourriture, leur médecine, leur abri, tandis que les animaux aident les plantes à la pollinisation, la germination, et le déplacement d'un endroit à un autre ! Encourager les visiteurs des zoos et des jardins à faire ces liens est essentiel. Ils peuvent ainsi acquérir des informations sur l'importance des écosystèmes, leur fragilité et comment eux-même sont intégrés à l'écosystème global. De plus en plus, les zoos reconnaissent l'importance de développer des programmes éducatifs qui lient ensemble les plantes et les animaux. Les exemples suivants nous fournissent un échantillon des programmes proposés.

Resumen

Plantas y animales están estrechamente interconectados. Las plantas aportan a los animales alimento, medicina y refugio, mientras que los animales contribuyen a la polinización, germinación y al desplazamiento de las plantas de un lugar a otro! Promover esta interconexión entre los visitantes es esencial. Pueden aprender acerca de la importancia de los ecosistemas, su fragilidad y cómo ellos mismos están conectados a este ecosistema planetario. El reconocimiento de los zoológicos para incorporar programas educativos que involucren tanto a plantas como animales va en aumento. Los siguientes estudios de caso son un ejemplo de los programas que ofrecen.

Bottom: 'The Amazing Maize Machine' used to explain the many uses of maize at Chester Zoo

Bottom left: Visitors to Chester Zoo's rainforest exhibit engrossed in the Brazil Nut story (Photos: Chester Zoo)

De la cage au lion: un nouveau programme éducatif au Munda Wanga Environmental Park

Desde la jaula del león: un nuevo programa educativo en el Parque Ambiental Munda Wanga

Emma Stone

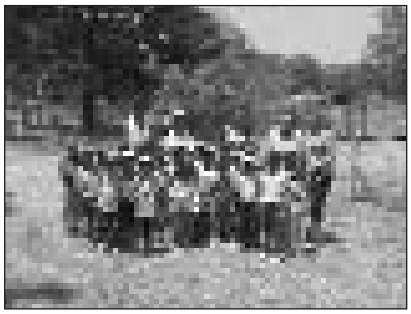
From the lion's cage

a new education programme at Munda Wanga Environmental Park

Right: A school group observes a warthog (Photo: Munda Wanga Trust)

Summary

Munda Wanga Botanic Garden was founded by Ralph Sander in 1950. It was the show piece of Zambia for many years but following Sander's death it entered a period of decline until it was taken over by the Munda Wanga Charitable Trust in 2000. This article describes the regeneration of the park and in particular the development of the environmental education programme. Using an old concrete lion cage, an Education Centre has been created which now houses a library, two education rooms, an interpretation room and an office. Other old cages have been used to construct habitat zones, reflecting those found in Zambia. Thanks to the funding and support from Chester Zoo (UK) and Bronx Zoo (USA) a great deal has been achieved in the education programme. This article documents these achievements and provides hope for other parks and gardens in similar situations.

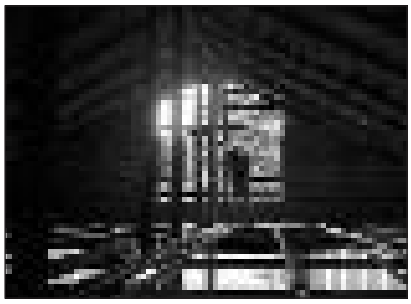


Right: Many local schools visit Munda Wanga (Photo: Munda Wanga Trust)

Founded by Ralph Sander in 1950, Munda Wanga (meaning 'My Garden' in Nyanja) was a botanical garden destined to be the show piece of Zambia. After the death of Ralph in 1978 the estate was sold to the government. Under government control the park continued to develop and gained many animal exhibits, including Bengal Tigers and American Black Bears donated by the Chipperfield Circus.

Over time however, the park was left to decay and in 1986 was finally offered for sale. Munda Wanga Limited took over the estate in 1998 and the Munda Wanga Charitable Trust was formed in 2000. Today the park and gardens are undergoing a complete rehabilitation programme, with new enclosures being built and endangered species breeding and propagation programmes well under way.

After two years of rehabilitation it was obvious that with over 55 per cent of visitors comprising children in school groups, there was a need for some educational activities at Munda Wanga. In 2000 a park-based education programme and interpretation centre was created. Since its creation in 2000, significant developments have been made. The early beginnings included a workshop funded by local companies to brainstorm ideas and develop links for the project.



Far top left: Before its renovation, Munda Wanga education centre was an enclosure, first for lions, then for warthogs

Far left: Rennovation took hard work

Left: The completed education centre at Munda wanga Environmental Park

(Photos: Munda Wanga Trust)

After gaining ideas and local support work commenced on developing an Education Centre to provide teaching facilities and a base for the education programme. Reflecting the ethos of Munda Wanga, it was decided to use the existing resources; the old concrete lion cage. It was felt that this concrete building would be a fantastic location for the Education Centre, giving the public an idea of what it would have been like living behind bars.

Still under development are the old holding cages around the main building which will be used to create habitat zones that reflect those found within Zambia. Today with funding from the British High Commission, Wildlife Conservation Society Bronx Zoo (USA) Chester Zoo (UK) and Cricket St Thomas Wildlife Park (UK), the centre now houses a well stocked library, two fully functioning education rooms, an interpretation room and education office.

With funding and support from Chester Zoo and WCS Bronx Zoo, the programme has also benefited from a number of capacity building initiatives. In 2003 a full time Zambian educator was hired to conduct and develop park based education programmes. This was supplemented by an in-house training programme for gardeners and security guards, and resulted in the recruitment of a gardener as a full-time education assistant. In September 2003 a week-long teacher training workshop was conducted within the Education Centre courtesy of WCS Bronx Zoo (USA). The workshop, conducted by Tom Naiman (WCS) and the Munda Wanga education staff enabled over 30 educators from all over the country to learn and develop new educational activities and techniques. This programme was a fantastic success and will be followed by other workshops in the coming year.

During this time Munda Wanga was continuing to develop links and networks within the Zambian Environmental Education community. Having played an active role in the development of the Zambian Network of Environmental Educators and Practitioners (ZANEEP) the Education Manager at Munda Wanga was elected as Vice President at the first Annual General Meeting in 2002. The AGM was hosted by Munda Wanga and this development was a great boost for Munda Wanga's education programme as a whole, placing it at the centre of environmental education activities across the country.

On an international scale Munda Wanga has reached out still further. After being funded by Chester Zoo to attend the African Zoo and Reserve Educators (AZOREN) conference in 2001, the Education Department at Munda Wanga offered to host the 3rd AZOREN conference in 2003. With funding from Chester Zoo, WCS Bronx Zoo, and the International Zoo Educators Association (IZE), the conference was a great success and was attended by over 30 delegates from more than nine African countries.

On the back of these developments the education team is now working hard to develop comprehensive park-based education programmes. This has been an ongoing process, assisted greatly by input from world-class educators at WCS Bronx Zoo. A number of workshops and themed outreach initiatives have commenced including a community based pet trade awareness campaign aimed at sensitising local people about the problems of keeping primates as pets. A park-based outreach programme has also been

Below: Inside Munda Wanga education centre (Photo: Munda Wanga Trust)

Above: Teaching tools for interactive learning within the Discovery Zone

Above right: Children get to meet some of the residents at Munda Wanga first hand

(Photos: Munda Wanga Trust)

ongoing, which with funds and logistical support from Toyota Zambia enables the education department to bring underprivileged groups to the park for education activities. It is clear that the education programme at Munda Wanga has developed significantly, however there is much more to do. Future plans include the development of an in-situ outreach programme within the rural communities in Zambia and comprehensive education programmes incorporating both botanical and wildlife tours and activities.

The progress of the education programme at Munda Wanga provides hope for other parks and gardens in similar situations. Anything is possible, even with little or few resources, as long as you have determination, passion and patience.

Résumé

Le jardin botanique de Munda Wanga a été fondé par Ralph Sander en 1950. Il a été la vitrine de la Zambie durant de nombreuses années, mais après le décès de Sander, il est entré dans une période de déclin jusqu'à ce qu'il soit repris par le Munda Wanga Charitable Trust en 2000. Cet article décrit la renaissance du Parc et en particulier le développement de programmes éducatifs sur l'environnement. Utilisant une ancienne cage au lion en béton, un centre d'éducation a été créé qui abrite maintenant une bibliothèque, deux salles pour les activités éducatives, une salle d'interprétation, et un bureau. D'autres anciennes cages ont été utilisées pour reconstituer des habitats évoquant ceux que l'on trouve en Zambie. Grâce aux financement et à l'aide du Zoo de Chester (Grande Bretagne) et du Zoo du Bronx (Etats-Unis), beaucoup a été réalisé dans les programmes éducatifs. Cet article donne des informations sur ces réalisations et apporte de l'espoir aux autres parcs qui sont dans une situation similaire.

Resumen

El Jardín Botánico Munda Wanga fue fundado por Ralph Sander en 1950. Fue la obra maestra de Zambia por muchos años, hasta que después de la muerte de su fundador declinó para ser rescatado por la Fundación Caritativa Munda Wanga en el año 2000.

Este artículo describe la regeneración del parque y en particular el desarrollo del programa de educación ambiental. En una antigua jaula para leones de concreto se construyó el Centro de Educación el cual incluye una biblioteca, dos salones de educación, una sala de interpretación y una oficina. Otras jaulas viejas se han utilizado para construir diversos habitats de Zambia. Gracias al financiamiento del Zoológico de Chester (Reino Unido) y del Zoológico del Bronx (Estados Unidos) se han obtenido importantes logros que pueden motivar a otros parques y jardines en situaciones similares.

Emma Stone is the Former Education Manager of Munda Wanga Environmental Park.
P.O. Box 38267, Lusaka, Zambia.
Tel: +260 1 278456
Fax: +260 1 278529
Email: biopark@zamnet.zm
www.mundawanga.com
Emma can be contacted via Chester Zoo, Upton-by-Chester, Chester CH2 1LH, UK.
Tel: 01244 380 280.
Fax: 01244 371 273.
Email: www.chesterzoo.org.

For further details about ZANEEP contact the Secretary General on ecz@necz.org.zm. For information about AZOREN contact the AZOREN president Francis Maina at whwfec@wananchi.com.

Right: Painting a mural illustrating the local habitat at the Munda Wanga education centre. (Photo: Munda Wanga Trust)

Sally Walker, Adit Pal, B. Rathanasabapathy & R. Manikam

Indian zoological and botanical gardens
historical perspective and a way forward

Summary Many colonial botanic gardens kept wild animals. Some had respectable collections, which included great apes, rhinos, large carnivores and other exotica from neighbouring continental areas. This practice was probably most prevalent in Asia where it can be argued that the elaborate gardens of kings combined with their collections of wild animals created a way of thinking that influenced the future development of colonial botanic gardens. It was the colonial naturalists, however, that pursued, described and drew the myriad of species they found. And it is because of this, we know of the presence of captive wild animals in Asian botanic gardens. This paper describes some of these gardens, particularly in India, to provide a context for a new initiative, the Coimbatore Zoological Park Society in southern India.

The Coimbatore Zoological Park Society was established in 1986 by a group of wealthy and influential businessmen who acquired a 250 acres site surrounded by lush green hills 30 km from Coimbatore. Breaking from the tradition of government-owned large facilities in India, this non-profit Society has planned an innovative conservation park intended to replicate in microcosm the greater area in which it sits. The Nilgiri Biosphere Reserve (NBR) covers 5520sq. km. in the Western Ghats. It was established by the Ministry of Environment, Government of India, to provide a means of conserving the endemic and threatened flora and fauna of the area. Since its inception the Society has collected plants for re-creating the different biomes of the NBR in natural habitat exhibits. In the process it has built up the largest regional collection of endemic and threatened plants in the country. The first phase of the Park will be a public botanic garden which will teach about the biodiversity of the region.

Introduction

The collecting, categorizing and keeping of both flora and fauna has been documented in early societies in all continental areas except Antartica. Humankind gained control over flora and fauna by farming it – agriculture for flora, and domestication and husbandry for animals. Domestication was the beginning of keeping wild animals in captivity, but collecting wild animals and plants for pleasure or study came much later when privileged families set up large establishments far removed from wilderness.

The origins of botanical and zoological gardens and parks are not difficult to trace – from primitive to ancient civilizations (for example in Mesopotamia) when, according to Vernon Kisling (2000), "all classes of society had kitchen gardens and fishponds; royalty and the wealthy landowner class had shade gardens, ornamental gardens and parks" the larger of which contained animals. This was the case in the Indian Subcontinent as well, including 'hunting parks' which were more like managed forests.

Princely menageries and gardens, in the 18th and 19th centuries were maintained at great expense for aesthetic and intellectual pleasure or scientific inquiry. These pre-dated the public menageries and botanic gardens of 19th century zoos and botanic gardens but often allowed public access. There are many examples of botanical gardens keeping animals, such as Singapore in South East Asia, in India and other Asian countries. Many other countries in the region colonized by Europeans had agri-horticultural societies whose exhibitions and projects included displays of wild fauna, and from time to time these resulted in botanic gardens and menageries being set up, for example Singapore Botanic Gardens and Zoo Negara in Malaysia.
A significant example is the Barrackpore Park near Calcutta, in India, a beautifully landscaped garden with undulating hillocks and a large collection of both indigenous and imported plants, which belonged to the British Governor General. It was also the site of a government menagerie, the purpose of which was to collect and hold animals from all parts of the Indian subcontinent so they could be

described and illustrated for an 'inventory' of Indian fauna. Although the project closed after a few years the menagerie remained for seven decades serving both as an entertainment for locals as well as guests of the government. It also served as a holding area for animals that British naturalists wished to study further or to send 'home'. Sir Stamford Raffles, founder of Singapore and of the London Zoo, visited Barrackpore Park menagerie twice before returning to England to start the zoo. Raffles could hardly fail to note the combination of beautiful landscaping and surrounding vegetation, scientifically documented plants and animals which may have influenced him when he founded the London Zoo a decade later. The London Zoo is considered to be the first 'modern zoo' of our age.

Much has been written about the influence of colonial manners and methods. The British, for example, while attempting to create what passed for respectable botanical gardens in their sight found offense in both Mogal and Hindu styles. From the straight paths, right angles and geometric patterns of some royal gardens to the 'undisciplined mass of foliage united by rampant creepers' in others, nothing was quite right. The absence of an 'Indian' botanic garden style today may be due to the fact that colonial botanical experts were permitted to 'have their way' with so many significant gardens. On the other hand, Indian zoological gardens, some of them, at least, have their own recognizable identity (Harrison, B. 1962).

Indian biological parks

In the 20th century, a unique 'zoo form' developed by the Indian Forest Service and called a 'biological park' emerged, which evoked the vast hunting parks owned and managed by royals of early times. The biological park is clearly distinguished from a zoological or botanical garden, park, or even the 'biopark' by its attempt to replicate forests that previously flourished upon the site, with naturally regenerating vegetation. Very large moated enclosures (30 – 60 acres) including large tracts of rejuvenated forest and the best natural features and contours of the land, labeled trees, and a focus on fauna that is indigenous to the country are the signatures of Indian biological parks. There are several of these in India for example, Assam State Zoo, Guwahati; Indira Gandhi Biological Park, Vizak; Tirupati Zoo, Andra Pradesh; Nandankanan Zoo, Orissa.

During the colonial era zoology lagged behind botany as a scientific discipline (Vicziany, 1989). In current day India, however, established public animal facilities outnumber their floral counterparts significantly, and are generally much better organized with better records, signage, public education and cooperation between zoos. Public botanic gardens' collections in India are not as well-documented, nor have they organized their collections creatively, so that visitors would derive either learning or enjoyment out of them. Some gardens have added features to attract the public, not with plants but with elaborate lights for evening visits and musical fountains, such as the Brindavan Gardens near Mysore. Zoological gardens in India are more scientifically oriented and are starting to realize the importance of high quality facilities for both entertainment and education.

Many Indian zoological gardens and biological parks, particularly those managed by forest departments, maintain organized displays of plants, usually in a separate area but still on the zoo grounds. Some are named 'zoological and botanical gardens' or 'zoo-cum-botanic gardens'. Others cooperate with nearby gardens, such as the Nandankanan Zoo which constructed a bridge so that visitors to the zoo could easily reach the neighboring botanic garden. However, none of these zoo-cum-botanic gardens have documented their plants adequately or provided interpretation of them for their visitors.

Below: Larger plants are transported by traditional methods (Photo: Zoological Park)

Back to the ancients

Contemporary natural history facility managers might benefit from taking a serious look at the origins of botanic gardens and zoos, that is, the more natural facilities of the ancients which combined both flora and fauna in their fiefdoms. According to David Hancocks, a particularly 'evolved' zoo designer, when reviewing a chapter of the draft World Zoo and Aquarium Conservation Strategy,

"we have artificially subdivided institutions: we have parks that specialize in animals and other parks that specialize in plants, and museums that specialize in dead animals. We inherited this way of looking at nature from our 18th century western forebears who dissected nature in order to make sense of it.

Left: A wide diversity of plants are raised at the CZP nursery (Photo: Coimbatore Zoological Park)

There is no need and probably no utility in maintaining these subdivisions for our natural history institutions today."

There is some evidence of a trend in the direction indicated by Hancocks. Some American zoos have achieved museum status with the American Museums Association by undergoing a process of systematically documenting every species of plant and animal kept in their facility. Some zoos in UK, Europe, Australia and South East Asia document plants as well, for example Chester Zoo, UK, Rotterdam Zoo, The Netherlands, Perth Zoo, Australia and Singapore Zoo, south east Asia. And in contemporary zoo design there is a more widespread practice of incorporating vegetation from the targeted country or region into the design and landscape of enclosures, which are increasingly themed and designed around ecosystems, forest types or biomes rather than taxa. Some zoos also have extensive conservation projects which involve plants, such as the Singapore Zoo and Jurong Bird Park in Singapore, who have been researching *Heliconia*, a South American plant, together for years. Singapore Zoo alone has 200 varieties of *Heliconia*.

These trends bode well for a future transformation of zoos, botanic gardens, museums and even national parks and sanctuaries – our 'natural history institutions' – to more integrated facilities which project a clearer and more meaningful educational message than has been possible so far. Visitor studies of zoos are starting to suggest that zoos are not projecting the conservation message very effectively. In meeting the challenges of such an imperative, it is possible that more of the world's regions could develop their own unique form or style, such as India has with their biological parks, which better reflects their early history as well as their natural treasures.

A botanic garden and zoo in Coimbatore, India may achieve this vision in our lifetime.

Back to the future in Coimbatore, India

The upcoming Nilgiri Biosphere Botanic Garden and Conservation Centre is a pioneer attempt to integrate many new concepts. A group of creative and wealthy industrialists and wildlife enthusiasts formed a non-profit Society with the objective of establishing a modern zoo to meet the growing demands of their industrial city. An ambitious and detailed concept plan for the Nilgiri Biosphere Conservation Park (NBCP) was approved which included collecting appropriate plants for eight thematic zones, preparing the site, and numerous other tasks before even starting to prepare exhibits.

The project has been designed according to the forest types of the Western Ghats, one of two designated biodiversity hot spots. The project site is situated on the eastern slopes of the Nilgiri hills surrounded by the Nilgiri Biosphere Reserve (NBR), which is the project's theme. Rich in endemism, the NBR, is perhaps the most widely known mountain part of the Western Ghats. The project will replicate the NBR on its beautiful 250 acre site which is surrounded by hills and naturally undulating, with dramatic variety in its landscape.

South Indian forest types in the Nilgiri Biosphere Reserve constitute eight thematic vegetation zones: Evergreen Zone, Semi-evergreen Zone, Moist Deciduous Zone (with three belts of Moist Teak Forest, Bamboo Brakes and Mixed Deciduous Forest), Dry Deciduous Zone, Rain Shadow Zone, Montane Shola Zone, and Thorn Forest Zone. Animals, native to the NBR, will be settled into the appropriate zone.

From the outset, serious botanical research was established at the Coimbatore facility. Systematic collection, protection, propagation and planting of indigenous plants to re-create the different forest types of the Nilgiri Biosphere Reserve is a major undertaking. All plants are collected from legitimate sources, as scrupulously as a zoo will avoid illicit dealers for the animals.

Other ongoing works include

- propagation, germination studies, with 32 species of endemic and threatened rainforest species including *Artocarpus hirsutus, Baccaurea courtallensis, Dysoxylum malabaricum, Palaquium ellipticum, Canarium strictum, Vateria indica, Hydnocarpus pentandra* and *Cullenia exarillata* with records maintained on all parameters of the process
- research on the prevalence and intensity of pests and diseases of indigenous forest plantations, so that appropriate pest and disease control measures can be taken
- development of software for plant documentation and management to cope with the enormous quantity of data generated by day-to-day botanic activities. The program ENTADA has been named after India's largest pod-bearing climber *Entada rheedii*.

This work began 1992 and in that time the collection has grown to more than 100,000 seedlings of more than 400 species. Of these, more than 350

Above: *Canarium strictum* one of the endemic plants at CZP site (Photo: Zoological Park)

species of 40,000 seedlings subsist in the field. NBCP has more plants indigenous to the Nilgiri Biosphere Reserve than any other plant conservation area. In recognition of this, NBCP has been awarded a grant under the BGCI Investing in Nature programme, a part of the National Plant Conservation Programme. This programme aims to achieve one of the targets of the Global Strategy for Plant Conservation (GSPC), which is "60% of threatened plant species to be protected in accessible ex situ collections, preferably in the country of origin and 10% in recovery and restoration programmmes" (CBD, 2002).

As a result of its association with BGCI, the recently issued Global Strategy for Plant Conservation and the uniqueness of the collection, the zoo has decided to inaugurate the NBCP project by developing a dedicated botanical garden at the centre of the site. With the large number of plants already available and support from BGCI, such a garden can be opened within the year. The Anaikatty Wildlife Garden was originally planned to include a small exhibit area for small mammals, reptiles, and amphibians. The concept document for this has been rewritten with a botanical focus without having to change the basic plan. This part of the project is under way, with an eye to maintaining and expanding it in parallel to the development of the zoo enclosures, which depend so heavily on a very large amount of systematically managed vegetation.

The broad aims of the Nilgiri Biosphere Botanic Garden are to utilise the plant resources quickly and effectively as a start-up project, capitalizing on the biome-specific garden, found nowhere else in India, and in very few places anywhere in the world. This garden will be a nature and educational recreation spot with an environmental education programme with appropriate infrastructure and activities. The facility will be used to introduce and interpret the highly complex conservation park, consisting of animals as well as plants, to the public.

Neither conservation nor botanic garden education is new to the staff of NCBP. Collaborating with the local NGO Zoo Outreach Organisation (ZOO), a long term associate of the Project, NBCP organized training in botanic gardens education in 1995 with BGCI in Coimbatore, Bangalore and Trivandrum in southern India. ZOO and NCBP collaborate often with NCBP providing the venue and local organization for ZOO programmes. Recently NCBP staff created a 'Tiger Trail' at the zoo site especially for a 'Teachers for Tigers' training workshop for Coimbatore schoolteachers organized by ZOO and the Wildlife Conservation Society. ZOO has also organized training in captive management of small animals, such as invertebrates and amphibians in collaboration with the Coimbatore Zoo. The zoo staff also organise education programmes in the city as well as on-site for special events, such as Wildlife Week, Environment Day and Animal Welfare Fortnightly.

The botanic garden and conservation centre is intended to combine most elements of all the natural history institutions in keeping with David Hancocks' percipient comment. Zoos in India, largely due to some of the foresters and conservation-oriented bureaucrats of post-Independence India, have focused more attention on their native animals in large natural enclosures. The objectives of this botanic garden and conservation

A selection of botanic gardens and parks that kept animals during 19th and 20th century colonial India

Wazir Ali Khan's compound in Lucknow maintained gardens while hundreds of spotted deer, buck, birds, mammals and reptiles were kept in public view behind an iron fence.

The Botanical Gardens at Sarahanpur kept animals, some of which were painted by the artist employed by the garden to illustrate new specimens of flora.

Lalbagh Botanic Gardens in Banglore opened in 1866 with an animal collection which later included tigers, lions, monkeys, kangaroos, orangutan, rhinoceros until 1920.

Madras People's Park was founded in 1855 with a zoo section.

The Trivandrum Public Gardens and Museum founded in 1873 with live animals in cages and open exhibits. A Curator from Kew Gardens was brought over to plan the layout.

Victoria Gardens, Bombay, was founded as a botanical garden in 1862. After adding a menagerie the Gardens were officially converted to a combined zoo and botanical garden in 1889.

Udaipur Zoo, founded in 1878 by Maharaja Sajjan Singh of Mewar State contained a garden with medicinal plants and a specialist in horticulture from 1882-1920.

The Maharaja of Baroda maintained a large garden with a collection of wild animals open to the public which inspired and stocked the Sayyaji Baug Zoo, officially opened in 1879.

Chamarajendra Zoological Gardens at Mysore was a 10 acre 'palace zoo' administered by the Department of Horticulture until it was transferred to the Forest Department in the 1970s.

Other royals had private menageries in their public gardens at Alwar, Gwalior, Indore and Kolhapur which are officially registered as zoos in India today.

centre are conservation, research and education of the surrounding flora and fauna exclusively. The NBCP function as a dynamic interpretation centre of the Nilgiri Biosphere Reserve.

References

- Harrison, B., 1962, *The evolution of zoological gardens,* Proceedings of the Meeting of the International Union of Directors of Zoological Gardens at Singapore, IUDZG, Singapore.
- Kisling V., 2000, *Colonial Menageries and the Exchange of Exotic Faunas*, Archives of Natural History 25(3): 303-320, London, UK
- Vicziany, M., 1989, *Imperialism, botany and statistics in early 19th century India, the surveys of Francis Buchanan (1762-1829)*, Modern Asian Studies, 20, 625.
- CBD, 2002, *Global Strategy for Plant Conservation*, The Secretariat of the Convention on Biological Diversity, Montreal, Canada.

Résumé

Beaucoup de jardins coloniaux maintenaient des animaux sauvages en captivité. Certains avaient des collections respectables qui comprenaient des grands singes, des rhinocéros, des grands carnivores, et d'autres animaux exotiques provenant des aires continentales voisines.

Cette pratique était probablement plus répandue en Asie où l'on peut dire que les jardins soignés des Rois, associés à leurs collections d'animaux sauvages, ont créé une façon de penser qui a influencé le futur développement des jardins botaniques coloniaux. De plus, ce furent les naturalistes coloniaux qui ont pourchassé, décrit et dessiné la multitude d'espèces qu'ils ont trouvée. C'est la raison pour laquelle on trouve des animaux captifs dans les jardins botaniques d'Asie. Cet article décrit quelques-uns de ces jardins, particulièrement en Inde, pour fournir le contexte d'une nouvelle initiative : le Coimbatore Zoological Park Society en Inde du Sud.

Le Coimbatore Zoological Park Society a été créé en 1986 par un groupe d'hommes d'affaire riches et influents qui ont acheté un site de 100 Ha entouré par des collines à la végétation luxuriante à 30 Km de Coimbatore. Rompant avec la tradition indienne des terres appartenant au Gouvernement, cette société à but non lucratif a imaginé un parc innovant pour la conservation en ayant pour objectif de recréer, dans un microcosme, les différents milieux situés aux alentours. La réserve de la Biosphère de Nilgiri (NBR) couvre 5520 Km² à l'ouest du Ghats. Elle a été mise en place par le Ministère de l'Environnement du Gouvernement de l'Inde pour disposer des moyens nécessaires à la conservation des espèces végétales et animales endémiques et menacées de cette région. Depuis ses débuts, la Société a collecté des plantes pour recréer les différents biomes de la NBR à travers une représentation des habitats naturels. Dans ce cadre, la plus grande collection régionale de plantes endémiques et menacées du pays a été constituée. La première phase du Parc sera d'aménager un jardin botanique public qui apportera des informations sur la biodiversité de la région.

Resumen

Muchos jardines botánicos coloniales resguardaban animales silvestres. Algunos tuvieron colecciones respetables que incluían maravillosos monos, rinocerontes, grandes carnívoros y otros animales exóticos de áreas continentales circunvecinas. Probablemente esta práctica prevaleció en Asia donde se argumentaba que los elaborados jardines de la realeza combinados con sus colecciones de animales silvestres crearon un a forma de pensamiento que influenciaron el futuro desarrollo de los jardines botánicos coloniales. Sin embargo, fueron los naturalistas de la Colonia quienes se dedicaron a describir y dibujar la miríada de especies que encontraron. Debido a esto, sabemos de la presencia de animales en cautiverio en jardines botánicos de Asia. En este artículo describimos algunos de estos jardines, particularmente en India, los cuales forman parte del contexto de una nueva iniciativa, la Sociedad Parque Zoológico Coimbatore en el sur de la India.

La Sociedad Parque Zoológico Coimbatore se estableció en 1986 por un grupo de acaudalados empresarios quienes compraron 250 acres rodeados por verdes colinas a 30 Km de Coimbatore. Rompiendo con la tradición de la exclusividad gubernamental para poseer grandes extensiones de terreno, esta sociedad sin fines de lucro diseñó un novedoso parque para la conservación el cual pretende replicar un microcosmos del área mayor en la cual se ubica. La Reserva de la Biosfera Nilgiri (NBR) cubre una superficie de 5520 Km² en las montañas occidentales (Ghats). Fue decretada por la Secretaría del Ambiente del Gobierno de India, con la finalidad de proteger y conservar la flora endémica y amenazada del área. A partir de su reconocimiento la Sociedad ha colectado plantas par re-crear los diferentes biomas de la reserva estableciendo colecciones que muestran los habitats naturales. En la actualidad comprende la mayor colección de plantas endémicas y amenazadas del país. La primera fase del Parque será un jardín público donde se enseñará acerca de la biodiversidad de la región.

Sally Walker, 29-1, Bharati Colony, Peelamedu, Coimbatore 641 004, Tamil Nadu, India.
Tel: (91) 422 561 087; 563 159.
Fax : (91) 422 563 269.
Email : zooreach@vsnl.com.
Website: www zooreach.org

Dr Rathinasabapathy & R. Manikam, Coimbatore Zoological park & Conservation Centre, 1388, Avinashi Road, Peelamedu, Coimbatore 641 004, Tamil Nadu, India.

Below: Hands-on experience with plants by students during a nature trail (Photo: Coimbatore Zoological Park)

Kathy Stewart

Gondwana connection
partnerships for learning

Summary The Australian Biota Study Day is a school excursion where Education Officers from the Royal Botanic Gardens Sydney join with those from the Australian Museum and Taronga Zoo to provide a unique learning experience for senior biology students. On the day 16-17 year old students visit the Australian Museum, the Royal Botanic Gardens Sydney and Taronga Zoo Educators (stationed at the RBGS Education Centre) for hands-on workshops that deepen their understanding of the evolution and adaptations of Australian native plants and animals.

Introduction

Education programmes for senior school students are offered by many excursion venues yet this visitor group can be particularly difficult to entice into learning environments beyond the school classroom. In New South Wales the final two years of schooling culminate in major examinations. These often determine students' future career pathways – it is a significant time for students, their families and their teachers.

Education officers from the Royal Botanic Gardens Sydney (RBGS), the Australian Museum (Austmus) and Taronga Zoo recognised the need for an excursion programme that attracted senior schools by addressing curriculum requirements and offering efficient use of the excursion day. In 2000 a new senior biology syllabus was released to schools presenting an opportunity for the three institutions to create a joint programme for this group of students. A pilot programme called the Australian Biota Study Day was developed and successfully trialled at the end of 2000. Now in its fifth year, the study day is routinely offered by the three venues as part of their schools' programme.

The Australian Biota Study Day

The combined resources of the RBGS, Austmus and Taronga Zoo enable senior biology students to experience the following:

- living environments similar to those at critical times in Australia's geological past, including a grove of the Wollemi Pine's closest relatives – the Hoop Pine and Queensland Kauri Pine as well as the Wollemi Pine itself
- actual fossils from sites such as Riversleigh (20 million years ago), Tingamurra (50 million years ago) and Talbragar (175 million years ago)
- live animals that demonstrate links with our Gondwanan heritage such as the echidna, blue-tongue lizards, rainbow lorikeets.

The logistics of the day involve four classes (up to 100 students) visiting the RBGS and the Austmus. Taronga Zoo transports its educator accompanied by a host of supporting animals in the 'Zoomobile' to the Gardens each day. Students and their class teacher spend two hours at each location, taking a further hour to have lunch and walk between the venues. Bookings are taken by the Austmus and students are charged a nominal fee which is divided between the three institutions.

In the session at the Royal Botanic Gardens, students compare the Wollemi Pine and its relatives to fossil members of the Araucariaceae (*Agathis jurassica* from the Talbragar Fish Bed fossils found near Mudgee in New South Wales). They are helped to visualise prehistoric environments by visiting various locations in the Garden where the plant displays consist of modern day examples of primitive plant species. Students are also able to continue their study of pollination and dispersal mechanisms of Australian plants using the live specimens growing in the Gardens.

The Zoomobile transports an exciting range of Australian animals from Taronga Zoo to the visiting students. 'Pugsly' the echidna and 'Spike' the rainbow lorikeet dominate the day's events and are very popular with the students and their teachers. Students have close physical contact with the animals – under the watchful eye of the zoo educator who directs and focuses

student attention to particular features of the animal that enables them to survive in their particular environment. Evaluation of the day reveals that this experience with live animals is a highly memorable and engaging feature of the day for students and their teachers.

At the Australian Museum students review evidence that indicates Australia was once part of Gondwana and study key Australian fossils that shed light on the nature of past environments. Students can trace evolutionary changes that led to animals such as the platypus, koala, thylacine and kangaroo.

Educational Features of the Study Day

Education officers involved in the project agree that there are a range of critical educational components of the day. One of the most important being, that students are able to physically interact with the resources of the three institutions. The resources used, such as live plants and animals, garden displays, objects and exhibitions meet a range of criteria including:

- relevance to the specific syllabus content
- interest to senior students
- able to be handled or accessed by students
- physically transportable to locations off site.

Throughout the study day, students are encouraged to keep a record of the day. Traditionally this takes the form of worksheets containing questions that focus students' attention on specific features of the session. Teachers involved with the programme are sent a set of worksheets that cover the activities set for the day. However education officers involved in the programme are mindful that the completion of worksheets does not distract student attention from the unique opportunity to observe and interact with the rich range of resources available. School groups are encouraged to bring cameras to record visual images of the resources and activities they encounter. In some cases groups are able to take selected specimens (such as plant material) back to school for further study.

Teachers and students are asked for feedback to monitor the impact of the programme. Evaluation sheets are given to each participating teacher and collected at the end of the day. A number of students are also surveyed to obtain their feedback. Changes to content, worksheets, timing and location of the study days have been made in response to the evaluation of the programme.

Examples of teacher feedback about the day:
"Students were fully occupied. This was good. Very relevant to the topic"
"Excellent organisation overall. Wonderful opportunity for hands on viewing of species and fossil specimens."
"Excellent resources and exhibitions. We don't have access to many of these resources."

Examples of student feedback:
"Gives us a chance to see what we are studying close up."
"Better than a day at school."
"Busy, a bit short of time but enjoyable."

Conclusion

The success of the Australian Biota Study Day has resulted in expanding its range of locations from Sydney to Mount Annan and Mount Tomah Botanic Gardens and most recently to Dubbo Plains Zoo. These new sites for the study day facilitate access to the resources of the three institutions to those schools that may not be able to travel to Sydney.

The study day series averages per year 2000 students from up to 80 secondary schools across New South Wales. The programme is a vital component of the range of school programmes offered by the RBGS, Austmus and Taronga Zoo and plays a significant role in the education of adolescents about the evolution, diversity and adaptations of Australian plants and animals.

Above right: The Zoomobile at the Royal Botanic Gardens Sydney.

Above left: 'Pusgly' the echidna visits the Royal Botanic Gardens Sydney.

Left: Discovering 'dinosaur food'. Senior biology students encounter cycads at the Royal Botanic Gardens Sydney.

(Photos: Royal Botanic Gardens Sydney)

Resumé

La Journée d'Etude du Biotope australien est une sortie scolaire où les responsables pédagogiques du Royal Botanic Garden Sydney (RBGS) se joignent à ceux du musée australien et du Tarongo Zoo pour offrir une chance unique aux étudiants en dernière année de biologie de développer leurs connaissances. Pendant la journée, les étudiants de 16-17 ans rencontrent les éducateurs du RBGS, du musée australien et du Taronga Zoo (situé au Centre Educatif du RBGS) pour des ateliers pratiques qui leur permettent d'approfondir leurs connaissances de l'évolution et des adaptations des plantes et des animaux indigènes d'Australie.

Resumen

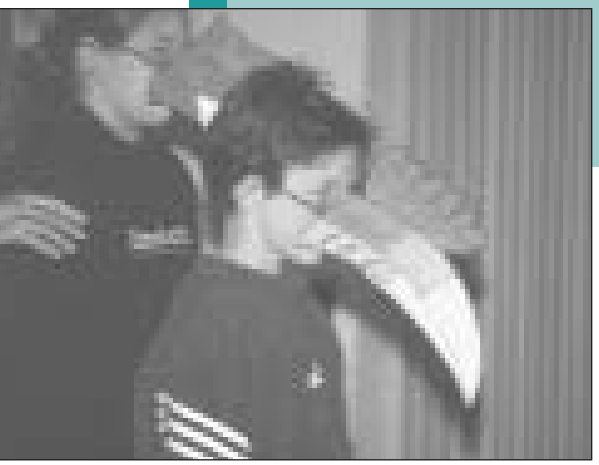
El día de estudio de la Biota Australiana consiste de una excursión escolar donde los funcionarios educativos de los Royal Botanic Gardens de Sydney (RGBS) se unen a los del Zoo de Taronga para dar una experiencia de enseñanza única a los estudiantes de biología más mayores. En ese día, los estudiantes de 16 y 17 años visitan a los educadores del Museo Australiano, el Real Jardín Botánico de Sydney y del Zoo de Taronga (localizados en el Centro de Educación del RBGS) para asistir a talleres prácticos que profundizan su entendimiento de la evolución y de la adaptación de las plantas y animales autóctonos de Australia.

Kathy Stewart is the Community Education Officer and Coordinator of School Progammes, Royal Botanic Gardens, Mrs Macquaries Road Sydney NSW 2000, Australia. Tel: (61) 02-9231 8111. Fax: (61) 02-9251 4403. Email: kathy.stewart@rbgsyd.nsw.gov.au www.rbgsyd.nsw.gov.au

Jamie Copsey

Conservation Education
the value of training

Summary Zoos and botanic gardens of the world are in unique positions to convey a conservation message to the general public. Although we have developed new and increasingly sophisticated techniques for communicating our messages, this 'education toolbox' is not currently available to all. The International Training Centre at the headquarters of the Durrell Wildlife Conservation Trust, Jersey Zoo, has been training overseas conservationists, many of them from developing country zoos, for more than twenty years. One of the most valuable subjects for them has been Environmental Education Skills and Practice. Such capacity building is also offered by BGCI and Kew through their education-focussed international diploma course. Other zoos and botanic gardens have recognised the need to develop capacity within their colleagues worldwide. However, gaps still exist. One solution would be for zoos and botanic gardens to join forces to support the professional development of our contemporaries, particularly in the biodiversity-rich regions of the world.



Below: School children act out a story about hornbills at their school (Photo: J.Copsey)

Introduction

"These visits by 6th formers were excellent. They broadened the girls' knowledge about the environment and sustainability issues." Another satisfied teacher leaves the Conservation Education Department at Jersey Zoo, the headquarters of the Durrell Wildlife Conservation Trust. A glance through the visitors' book strengthens the impression that Jersey Zoo can, metaphorically speaking, pat itself on the back for getting an 'informal' conservation message across to its visiting public. We know that through our public education programme learning has taken place; people are becoming more environmentally aware following a visit to the zoo (Muurmas, 2001).

What happens when they leave the zoo gates? Does learning result in behavioural change? A recent environmental awareness-to-action programme run by the Conservation Education Department, entitled 'Cans for Corridors', demonstrated the impact that an effective and focused education activity can have on changing our ways. Through a series of interactive assemblies run by zoo education staff in Jersey schools, local children learnt about the plight of the black lion tamarin (*Leontopithecus chrysopygus*) in its dwindling Atlantic forest home of southern Brazil. Furthermore they learnt about unsustainable use of resources, with the focus on aluminium. The result of this has been that now more than 21 of the island schools have established can recycling schemes and have generated over £900 to buy over 3500 trees for biological corridors in Brazil linking up the tamarins remaining forest patches (Esson *et al*, 2002).

This success is not unusual; type in 'zoo education' or 'botanic gardens education' into your web-search and you will find pages and pages of sites that will lead you to some exciting and innovative new programme for raising awareness of environmental issues and

species conservation. Look more closely, though, at where these education programmes are happening and a pattern begins to emerge. A disproportionate amount of activity is going on in the zoos and botanic gardens of North America and Europe.

This pattern may be explained partly by the skew that exists in the distribution of the zoos and botanic gardens of the world. Four out of the six countries in the world that hold 57% of the world's zoological collections are within Europe or the United States. Only ten countries account for 50% of the world's botanic gardens, including the US and Europe (Stanley-Price *et al*, 2004). But what about the remaining 1000 zoos and 1200 or so botanic gardens (Stanley-Price *et al*, 2004) that are spread throughout the world? Many of them fall within the tropics where we also find the majority of species that, as conservation organisations, zoos and botanic gardens are intent on saving.

Increasingly we are aware of the need to focus our attention more on saving species in-country. Reportedly over 400 botanic gardens worldwide manage areas of native habitat themselves, or work closely with colleagues in national parks and other protected areas (Wyse Jackson & Sutherland, 2000). A study of British zoos by Stevenson (1996) found that over 69% (32) of collections that participated in the survey supported field projects to some degree. To what extent though, do zoos and botanic gardens 'leapfrog' their peers in biodiversity-rich countries to work directly with the species and habitats needing to be conserved?

Read through the article text relating to the Convention on Biological Diversity (UNEP, 1994) and one word that will keep appearing is 'co-operation', in particular with reference to similar organisations working in the resource-rich and biodiversity-rich countries of the world. The recent launch of the Communication, Education and Public Awareness (CEPA) portal demonstrates the international belief that more needs to be done to support the development of more effective strategies to get our conservation message out and make sure it sticks.

So what can or should zoos and botanic gardens be doing to support this drive? They have the potential to "shape public opinion, to encourage sympathetic attitudes towards wildlife, and to educate the public about ecology, evolution, and wild animals" (Hancocks, 2001). With approximately 500,000,000 people (roughly 10% of the world's population) visiting zoos annually (IUDZG/CBSG (IUCN/SSC), 1993), they have clearly got a potentially valuable role to play in raising environmental awareness. If we add in the numbers attending the botanic gardens of the world then together we have a vast captive audience. Ironically at an institutional level it is the zoos of biodiversity-rich countries that stand out as being the places to reach the majority of these visitors. Take China, for example, where over 40 million people pass through the country's zoo gates each year (Waugh & Wemmer, 1994); Zoológico de Chapultepec, Mexico City receives 5.5 million visitors alone; more than three times the number of people visiting London Zoo each year (1,225,000) (http://www.cbsg.org/directory)

Time to take stock: we know that many zoos and botanic gardens in the resource-rich countries of the world have been developing new and innovative ways of conveying a conservation message, and have been honing their educational tools for many years; these same organisations are beginning to look beyond their gates to determine how best they can support species/habitat conservation; we recognise that zoos and botanic gardens have a potentially pivotal role to play in raising environmental awareness and pushing for behavioural change; finally, we know that at least the zoos of the biodiversity-rich countries draw significant crowds and therefore are ideal places to convey a large-scale conservation message. The potential is there but in order to realise this we need to match up resources to where they are most needed. It is perhaps time for those zoos (and botanic gardens) of the world with the experience and skills to focus more attention on building conservation capacity within their 'peer' organisations of world's most biodiversity-rich countries.

Above: People listening to a talk in Sri Lanka, a biodiversity-rich country (Photo: J.Copsey)

At this point it is important to note that resources do not equate to effective conservation education and neither is it only the zoos and botanic gardens within the resource-rich countries that are effectively raising environmental awareness. However, it is clear that there is an imbalance in the current capacity within the zoos and botanic gardens of the world to carry this message forward. According to BGCI of approximately 1800 botanic gardens in the world only about one tenth employ education staff (Willison & Sutherland, 2001). Based on a sample of 100 zoos from the International Zoo Yearbook, it appears as if education staff are present in a higher proportion of zoos than botanic gardens but still less than 50% would seem to have this resource (Olney & Fisken, 2003). If zoos and botanic gardens are to realise their potential then they need to fill this gap. More support must be given to those establishments that are best placed to raise awareness about the plight of endangered species within the countries of origin. As Conway (2000) stated "We pay too little attention to third World zoos located on the front lines of the Earth's most biodiverse habitats". What are the "haves" doing for the "have nots" (Waugh & Wemmer, 1994)?

Above: One World School workshop in 2002 (Photo: J.Copsey)

Gerald Durrell was ahead of his time when he instigated the establishment of the International Training Centre (ITC) at Jersey Zoo over 20 years ago. His aim was to create a 'mini-university' for training conservationists from around the world, in particular from zoos, in order to equip them with the skills and understanding required to solve their own conservation problems. Since this time more than 1100 graduates have passed through the ITC's training programmes from over 110 countries. Over 90% of these graduates are linked through the ITC Network, providing a virtual venue for discussions and problem-solving to meet the evolving needs in conservation. The ITC's courses in *Endangered Species Management and Conservation* challenge participants to critically analyze current biodiversity conservation issues and to develop appropriate solutions for tackling wildlife conservation issues in their own countries. One of these solutions involves the ability to communicate a conservation message effectively to a range of audiences.

The majority of trainees that pass through the training programme have not had any form of formal training in teaching skills or communication and yet they are on the 'front-line' of species conservation, many of them coming from biodiversity-rich countries such as Madagascar, Peru and China. Although an increasing number of the organisations from which we select participants do assert that they run education programmes, it is common for them to be run as part of a raft of responsibilities borne on the shoulders of just a handful of interested and able employees.

One such able person is Uzma Khan, a senior education officer from Lahore Zoo in Pakistan. Uzma is three quarters of the way through her Diploma here at the ITC and in her capacity as an education officer has found the education component of the course of particular relevance to her work in Pakistan. Lahore Zoo receives 2.5 million visitors every year including over 1400 school groups, which may contain as many as 300 children in each one (Khan, pers. com.). According to Uzma "there is no zoo in Pakistan that has an education centre and there is no regular, coordinated programme with schools that is run by any zoo". Conservationists such as Uzma have the drive and often the ability to run effective education and awareness programmes but they can gain much from exposure to and training in the theory and practice of teaching and learning. Skills that Uzma and others are encouraged to acquire during their time on the ITC course.

Such skills are not only of value to designated education staff but to anyone who has to communicate a message to an audience. A study conducted by Esson et al (2001) demonstrated that presentation skills was the most valued part of the education module on the *Diploma in Endangered Species Management* (DESMAN) course, in terms of its use when the trainees returned home. Conway (op. cit) identifies a need to target our message to "inform law-makers and government authorities". Clearly having a competency at presenting information to such audiences is of benefit to all.

Other organisations with resources have established focused environmental education training courses. Botanic Gardens Conservation International and Royal Botanic Gardens, Kew, have joined forces to create the *International Diploma Course in Botanic Gardens Education*. A glance through the web page demonstrates the diverse range of topics that are covered providing participants with a sound and detailed understanding of the 'tools' of the education 'trade'.

Only a handful of conservation organisations are in the fortunate position to maintain a full training department dedicated to supporting conservation practitioners worldwide. However, many more can boast an effective and imaginative environmental education programme. Both the zoo and botanic gardens communities are becoming increasingly active in seeking ways of contributing to species and habitat conservation. If we feel genuinely that both types of organisation are justified in their role as conservation organisations in particular through education, then we need to turn more attention to supporting our colleagues that have the species and habitats we are trying to conserve right on their doorstep. The education toolbox is bursting with new techniques- let's open up the box to all.

Parting remarks…
Having the opportunity to write this article has enabled me to think more critically about how the ex-situ conservation organisations such as zoos and botanic gardens operate. This contemplation has not just made me question how we currently do things but how we could be doing things in the near future. How often, for example do zoos and botanic gardens get together to 'cross-pollinate' ideas about conservation education in their different though complementary areas of work? Zoo educators are increasingly trying to put their animals into context – what niches do they fill? What other species do they depend on? What will happen if we take away the plants on which they- and we- depend? From a botanical standpoint we are becoming more aware of the reliance of threatened plant species on the animals with which they co-exist – what will be the impact of the extinction of particular species of fruit bats, for example, on the trees that rely on them to disperse their seeds? If we want to convey a holistic conservation message then perhaps it is time for zoos and botanic gardens to pool their educational experience and develop

joint education strategies and most importantly export this 'meta-tool box' to their colleagues elsewhere. Is it time for an International Diploma Course in Zoo and Botanic Gardens Education?

What do you think? Should we be collaborating more in the field of conservation education?

References

- Conway W. (2000) *The changing role of zoos in the 21st century*. EAZA News 29, 8-13.
- Esson M. (2001) *Does conservation education travel well? Transferring skills from Jersey Zoo to institutions in the developing world*. Dodo 37, 80-87.
- Esson M., Hicks O., Wormell D. (2002) *Your cans can save the black lion tamarin*. Federation of Zoological Gardens Award, Education Category 2001/2002
- Hancocks D. (2001) *A different nature- The paradoxical world of zoos and their uncertain future*. University of California Press, London England.
- IUDZG/CBSG (IUCN/SSC), 1993. *Executive Summary, The World Zoo Conservation Strategy; The Role of the Zoos and Aquaria of the World in Global Conservation*. Chicago Zoological Society, U.S.A.
- Muurmans M. (2001) *Getting the conservation message across. An evaluation of the animal talks programme of Jersey Zoo, Durrell Wildlife Conservation Trust, Jersey UK Channel Islands*, Unpub. Report.
- Olney P.J.S., Fisken F.A. (2003) (eds.) *Zoos and aquariums of the world*, in International Zoo Yearbook 38, Zoologial Society of London, England.
- Stanley-Price M.R., Maunder M., Soorae P.S. (2004) *Ex Situ Support to the Conservation of Wild Populations and Habitats: Lessons from Zoos and Opportunities for Botanic Gardens*, in Guerrant E.O., Havens K., Maunder M. (eds) Ex Situ Plant Conservation Supporting Species Survival in the Wild, Island press, Washington DC, USA.
- Stevenson M.F. (1996) *The role of zoos in the British Isles and their survival into the next millennium*, dissertation for MBA, University of Edinburgh, Scotland
- UNEP (1994) *Convention on Biological Diversity Text and Annexes*, Convention on Biological Diversity Secretariat, Geneva, Switzerland
- Waugh D.R., Wemmer C. (1994) *Training in zoo biology: two approaches to enhance the conservation role of zoos in the tropics*, **in** Olney P.J.S., Mace G.M., Feistner A.T.C. (eds) Creative Conservation: Interactive management of wild and captive animals, Chapman & Hall, London, England.
- Willison, J and Sutherland, L.A (2001) T*he Role Botanic Gardens Can Play in Biodiversity Education and Community Mobilization*, Paper presented to an Expert Meeting on Biodiversity Education and Public Awareness, Egmond aan Zee, The Netherlands.
- Wyse Jackson P.S., Sutherland L.A. (2000) *International Agenda for Botanic Gardens in Conservation*. Botanic Gardens Conservation International, U.K.

Résumé

Les zoos et les jardins botaniques du monde ont une chance unique de faire passer des messages sur la conservation de la biodiversité au grand public. Malgré que nous ayons développé de nouvelles techniques de plus en plus sophistiquées pour communiquer nos messages, cette 'boîte à outils' pédagogiques n'est pas accessible à tous aujourd'hui. Le Centre International de Formation, situé dans les locaux de la Fondation 'Durrell Wildlife Conservation' au Zoo de Jersey, forme des conservateurs venant de zoos de pays en voie de développement depuis plus de 20 ans. Un des sujets les plus utiles pour eux a été le module sur les compétences et pratiques de l'éducation à l'environnement. Le BGCI et Kew permettent également le développement de compétences similaires grâce à leur diplôme international centré sur l'éducation. D'autres zoos et jardins botaniques ont reconnu cette nécessité de développer les compétences de leurs collègues à travers le monde. Cependant, des vides existent toujours. L'une des solutions serait que les zoos et jardins botaniques mettent leurs forces en commun pour développer la formation professionnelle de nos collègues, en particulier dans les régions du monde riches en biodiversité.

Resumen

Los zoos y los jardines botánicos del mundo están en una posición única para comunicar el mensaje de conservación al público. Hemos desarrollado nuevas técnicas más y más sofisticadas para comunicar nuestros mensajes, pero esta "caja de herramientas educacional" no está a disposición de todos. El International Training Centre (Centro de Educación Internacional) en la sede del Durrell Wildlife Conservation Trust, en el Zoológico de Jersey, lleva mas de veinte años educando a conservacionistas de otros paises, muchos de ellos de paises en vía de desarrollo. Uno de los temas de mayor valor para ellos ha sido el de habilidades y prácticas medioambientales. Las mismas oportunidades para desarrollar capacidades también las ofrecen el BGCI y Kew a través de su curso de diploma internacional con enfoque educativo. Otros zoológicos y jardines botánicos han reconocido la necesidad de desarrollar la capacidad entre sus compañeros a través del mundo. Sin embargo, aun hay huecos que rellenar. Una solución sería que los zoos y los botánicos unieran fuerzas para apoyar el desarrollo profesional de nuestros contemporáneos, especialmente en las regiones del mundo ricas en biodiversidad.

Jamie Copsey is Deputy Head of Education at Durrell Wildlife Conservation Trust, Les Augrés Manor, La Profonde Rue Trinity, Jersey JE3 5BP, English Channel Islands, British Isles.
email: info@durrellwildlife.org.
web: www.durrellwildlife.org

Left: Trainees in action – drama as a holistic educational tool. (Photo: J.Copsey)

Should botanic gardens keep animals as exhibits?

This issue of Roots has argued that both zoos and gardens need to take a more ecological approach to education – emphasising both plants and animals. If we consider that our aim is to always offer visitors first-hand experiences, then does it follow that botanic gardens should keep animals as exhibits? We asked a number of colleagues around the world for their opinions on this question. Their considered responses throw up interesting issues and questions that will be of interest to both botanic gardens and zoos alike.

Integrating ecology - do we need to keep animals?

A garden, if managed in an environmentally friendly manner, has many animals within it - it is their habitat. We need to realise that this gives us the ideal opportunity to develop ecological education with reference to the wildlife of our gardens, without the need to bring in other, perhaps more exotic species. Depending on the size and location - and indeed on the surroundings of the gardens, there will be examples within them of wildlife of many different species demonstrating many ecological issues - nesting of native birds, migration of species and their annual cycles, colonisation by exotic animals and their impact on the local ecology, feeding strategies of lizards, species specificity of insect food plants, and many more. This is happening all around us, and very often, even if we ourselves realise it, we don't put it across to our visitors. The fact is that, even without keeping animals, we can put a very wide ecological message across.

In the Gibraltar Botanic Gardens we also keep animals. Initially this was as a result of us offering space in a disused corner of the Garden to house parrots and monkeys confiscated by Gibraltar Customs having arrived within the jurisdiction without CITES papers. The collection grew with other confiscated animals, such as tortoises from nearby Morocco, being entrusted to our care. Once incipient facilities were there, other projects such as captive breeding of rare native species for subsequent release started to develop, and a certain demand to house unwanted pets was also partly met. The facilities are still being developed, and as they do, there are certain lessons learnt that need to be shared.

Unless the exhibits generate sufficient income through properly managed visiting, or perhaps grants for animal conservation projects, they can draw heavily on a garden's resources. Where these are not great they can be an unsustainable strain which could prejudice other aspects of a garden's work. Looking after animals carries with it great responsibilities, including legal obligations in many countries, and animal welfare issues. Animals also require ample space, and planning will require decisions on which parts of the gardens to convert. It can work - but be careful. It is much easier for an established zoological park to improve its plant interpretation and education work than for a botanic garden to introduce this new, demanding facet to its work.

And there is one more point to consider also - whether we like it or not, animals tend to attract the attention of the public more than plants. Our message on plants, and our attempts at getting them to feature in the public's perception of ecology, may suffer if the limited time a visitor spends in our garden is spent looking at cuddly baby monkeys, fascinating reptiles, or majestic birds of prey.

John Cortes is Director of the Gibraltar Botanic Gardens. Trained in Ecology, his Doctorate is in reptile ecology. He is also General Secretary of the Gibraltar Ornithological & Natural History Society, which is a Partner of BirdLife International
Gibraltar Botanic Gardens, The Alameda, Red Sands Road, Gibraltar.
Email: jcortes.gbg@wildlife.gib.gi.
www.gibraltar.gi/alameda

Animals reinforce the message

Cleveland Botanical Garden regards animals as essential to communicate the reliance of all life upon plants. Animals engage visitors by adding motion, surprise, color, and even scent.

In the biomes of the Eleanor Armstrong Smith Glasshouse, animals taking refuge within a model strangler fig serve to demonstrate plant-animal interactions. Giant South American Cockroaches provide a great "ICK!" factor! A tarantula's burrow beckons children to investigate further. Leaf-cutter ants tend fungus gardens within a fallen tree and forage along a vine looping over a stream. Every day, birds and butterflies pollinate flowers and disperse seeds. These diverse interactions have created an environment that immerses visitors in the biomes.

This was made possible through planners selecting animals that offered interesting stories. Concerted research and coordination was undertaken to ensure that the animals would live harmoniously with plants, each other and people. The animals needed to be available in the trade (zoos, breeders), be easily maintained and be capable of living successfully in captivity. For example, maintaining tropical butterflies requires an abundance of sunlight, temperatures of 70-90°F, high relative humidity and nectar-producing plants. The birds inhabiting each biome have their own specific requirements and this in turn influences plantings, structure, and staffing. This process although complex has resulted in a wonderful educational resource.

Cynthia Mazer and Sandra Rode, Cleveland Botanical Garden, 11030 East Boulevard, Cleveland, OH 44106. Tel: 216.721.1600. Fax: 216.721.2056. Email: info@cbgarden.org

An unwelcome distraction!

Over the years I have had my fill of competing with cute little animals. When I worked as an education officer I was continually in competition with the fish and squirrels of the botanic garden. How can anyone expect to hold the attention of a group of eight year olds when a fury little squirrel is doing party tricks in the hope of a bit of some ones lunch? 'Fish time' became a regular feature of rainforest tours passing by the tropical pond and only after a compulsory five minutes of mutual staring between coy carp and not-so-coy children was over could the lesson proceed. Then somebody introduced green tree frogs to the glasshouses as a form of biological control. This was even more annoying. When you walk into the house they all start to sing and the children get very excited. "Yes" you say "they are real frogs" and the children scatter to search for them. But try as hard as you like the cunning frogs never reveal themselves. Move within a metre and they are silenced with the songster hidden deep in the undergrowth.

The solution to all my animal problems? Recently curator, David Mitchell, began commissioning a series of beautiful life-size bronze animal sculptures for the glasshouses. Roadrunners now run across the Sonoran desert, bats pollinate the Saguaro cactus and spade-foot toads emerge from the bronze quagmire. We even have a small but perfectly formed bronze dinosaur standing gingerly among the tree ferns. They fit marvellously among the foliage and best of all they never steal your thunder or your sandwiches!

Ian Darwin Edwards, Director of Public Programmes, Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, Scotland. Tel: 0131 552 7171. Fax: 0131 248 2901. E-mail: info@rbge.org.uk

The whole picture

Have you ever tried to put together a jigsaw puzzle with some of the critical pieces missing? It's frustrating having an incomplete picture at the end. It can be the same for botanic garden educators when teaching about biodiversity and conservation - for without the animals our stories are often incomplete.

Animals can enrich the learning experience by giving authenticity to ecological programs but their introduction and management needs to be thought through carefully. Animal exhibits are best integrated into ecological displays rather than stand alone enclosures. From the outset they should have a clear interpretive purpose and where possible link to the existing biodiversity of the garden. They are also more likely to succeed and be sustainable in the longer term if developed in partnership with zoos or animal specialists who have the appropriate expertise.

With these points in mind our garden, in partnership with our nearby zoo, has successfully released two species of native birds into our rainforest conservatory; the White-browed Woodswallow (*Artamus superciliosus*) for biological control of palm eating caterpillars and Noisy Pitta birds (*Pitta versicolor*) to help the leaf litter decay cycle. We also have a highly popular 'mini-beast' program for schools run by an invertebrate expert. Spectacular macro invertebrates are used to tell the story of rainforest plant/animal relationships in a dynamic and hands-on way.

The animals in both these programs quickly capture visitor interest and arouse their curiosity. The questions flow. Once we have their attention plants are introduced seamlessly and then highlighted as a natural part of the discussion. The animals are great attention grabbers and ultimately give a more complete story of the environment. Integrated thoughtfully with your plants they work wonders for ecological storytelling.

Steve Meredith, Education Officer, Botanic Gardens of Adelaide, North Terrace, Adelaide, South Australia. Tel: 61(0)8 82282311. Email: stevmer@bigpond.net.au

Right: Ranger, Sean Juandoo, introduces one of the snakes at The Aquatic Experience, London, a centre for education conservation and a sanctuary for rescued and endangered species (www.aquatic-experienced.org) (Photo: BGCI)

Introduce butterflies with caution

Breeding butterflies for an enclosed exhibit can be a wonderful tool to teach about insect life cycles, plant/animal interactions, and conservation. However, caution needs to be exercised when including butterflies in an outdoor exhibit. If non-native species are introduced it is important to consider how removal from their natural environment will impact their survival and the ecology of their ecosystem of origin, as well as their influence on the ecosystem to which they are introduced. If host plants are planted to attract native species to a garden there is a danger that these gardens will prove less hospitable to their offspring than a natural habitat.

In my graduate work I examined the utility of gardens in butterfly conservation. For the species I studied, butterfly eggs and larvae had lower survival rates in gardens than in natural sites. I was able to exclude lack of available food resources and higher natural enemy attack as the cause for the butterfly's low survival rates in gardens. Yet, I was unable to uncover the cause of poor performance in gardens. Given that I was only able to include one species in my study I cannot predict how butterflies in general will perform in gardens, only that some butterflies will be negatively affected by breeding in gardens. I urge curators to monitor butterfly populations in their gardens and introduce programs for individuals to do the same in their own yards/gardens. Monitoring of butterfly populations within gardens will also give us clues to how we can best maintain butterfly populations internationally.

Jacqueline Levy, Ecologist, 4226 Mt. Taylor Dr, Santa Rosa, CA 95404, USA.
Email; jlevym@juno.com

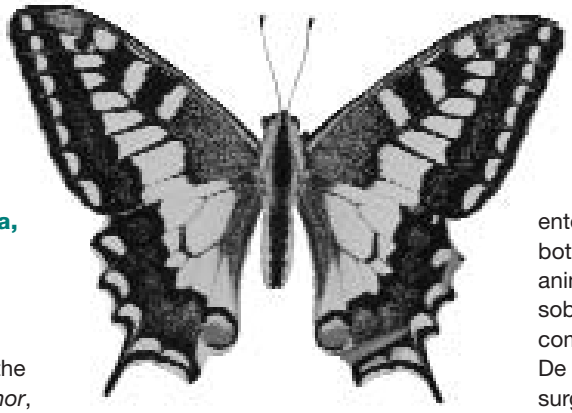
Are gardens effective in butterfly conservation? A case study with the pipevine swallowtail, *Battus philenor*, by Jacqueline Levy is published in the next issue of The Journal of Insect Conservation.

Opening Pandora's Box!

Horticulture is becoming increasingly important to zoos, many of which now aim to display their animals in an ecological context. Likewise, botanic gardens are increasingly incorporating animals into their exhibits. In principle, this is to be welcomed as it helps provide a more holistic view of nature to visitors.

However, by adding animals to their collections, botanic gardens must be aware that they may be opening a Pandora's box! The keeping of animals, in particular vertebrates, is strictly regulated in most countries. In the European Union, for example, permanent establishments where animals of wild species are kept for exhibition to the public for seven or more days a year are considered zoos under Council Directive 1999/22/EC. This implies complying with defined enclosure and husbandry standards, employing qualified animal keepers, contracting a zoo veterinarian, participating in research from which conservation benefits accrue to the animal species concerned, and/or other activities related to the conservation of wild fauna.

Peter Dollinger, Excecutive Director, WAZA (The World Association of Zoos and Aquariums), Post address: P.O.Box 23, CH-3097 Liebefeld-Berne, Visitors' address: Lindenrain 3, CH-3012 Berne.
Tel: +41-31-300 20 30.
Fax: ++ 41-31-300 20 31.



Resumé

Dans ce numéro de Roots, il est argumenté que les zoos et les jardins botaniques doivent avoir une approche plus écologique de l'éducation – avec un accent sur les plantes et les animaux. Si nous pensons que l'objectif est d'offrir aux visiteurs des expériences directes, faut-il alors que les jardins botaniques exhibent des animaux? Nous avons demandé à un certain nombre de collègues à travers le monde leur opinion sur la question. Leurs réponses soulèvent des questions intéressantes – qui concerneront autant les zoos que les jardins botaniques.

Resumen

Esta edición de Roots ha argumentado que tanto los zoos como los jardines deben tener una actitud más ecológica a la educación - dándole énfasis tanto a las plantas como a los animales. Si consideramos que nuestro objetivo es de siempre ofrecerle a los que nos visitan una experiencia de primera mano, entonces, ¿es lógico que los jardines botánicos exhibieran también animales? Le pedimos opiniones sobre este tema a algunos compañeros alrededor del mundo. De sus consideradas respuestas surgen temas y preguntas que le interesarán tanto a los jardines como a los zoológicos.

Claudy Fox

Resources

Resources

BBC Wildlife Magazine
BBC Magazines, BBC Worldwide Publishing, 80 Wood Lane, London W12 OTT. Tel. (44) 20 8433 2000.
ISSN 0265-3656
Annual subscription rates £34.80-41.50.

Wildlife is the only monthly magazine of its kind in the UK. Its features on wildlife stories, campaigns, photography and travel are written by familiar names and are often illustrated with stunning images.

Two sections at the front of the magazine are those that are most useful to those in conservation education and are international with their coverage. 'News of the Earth' often reports on levels of biodiversity, wildlife trades, habitat destruction and protection, introduced species, the over-harvesting of natural resources and climate change. 'Discoveries' summarises more scientific news from journals such as Nature and Science and allows one to update their natural history knowledge in just a few minutes.

RATEL
Association of British Wild Animal Keepers. Darren McGarry, ABWAK membership, Edinburgh Zoo, 134 Corstorphine Road, Edinburgh, EH12 6TS. ISSN 0305-1218.
Annual subscription £14 to £22.

RATEL is published every two months by the Association of British Wild Animal Keepers (ABWAK) and includes articles, letters and reviews for the interest of keeping staff.

Disponible

Magazín de la vida silvestre de la BBC
BBC Magazines, BBC Worldwide Publishing, 80 Wood Lane, London W12 OTT. Tel. (44) 20 8433 2000.
ISSN 0265-3656
Costo de la suscripción anual £34.80-41.50.

'Wildlife' es una revista mensual única en su genero en el Reino Unido. Los artículos sobre vida silvestre, políticas ambientales, fotografía y viajes están escritos por autores relevantes y suelen ir acompañados de sorprendentes imágenes.

Hay dos secciones al frente de la publicación que son las mas útiles en aspectos de educación en la conservación y que además son de cobertura internacional. 'Noticias de la tierra' frecuentemente trata sobre niveles de biodiversidad, comercio de la vida silvestre, destrucción y protección de habitats, introducción de especies, uso excesivo de los recursos naturales y cambio climático. 'Descubrimientos' resume la información científica mas reciente que aparece en revistas como "Nature" y "Science" permitiendo al lector actualizarse en pocos minutos con el conocimiento de las ciencias naturales.

RATEL
Asociación para la protección de animales silvestres en Gran Bretaña. Darren McGarry, ABWAK membership, Edinburgh Zoo, 134 Corstorphine Road, Edinburgh, EH12 6TS
ISSN 0305-1218.
Suscripción anual £14 a £22.

Recursos

BBC Wildlife Magazine
BBC Magazines, BBC Worldwide Publishing, 80 Wood Lane, London W12 OTT.
Tel. (44) 20 8433 2000.
ISSN 0265-3656
Souscription annuelle £34.80 - £41.50.

"Wildlife" est l'unique magazine mensuel dans son genre en Grande Bretagne. Ses articles présentant des histoires, des campagnes, la photographie et les voyages en relation avec la "vie sauvage" sont écrits par des auteurs aux noms connus et souvent illustrés par des images impressionnantes.

Deux rubriques à l'avant du magazine sont particulièrement utiles à ceux impliqués en éducation à la conservation et sont d'envergure internationale. 'News of the Earth' (nouvelles de la Terre) présente souvent des rapports sur les niveaux de biodiversité, le commerce d'espèces sauvages, la destruction et la protection d'habitats, les espèces introduites, la surexploitation des ressources naturelles et les changements climatiques. 'Discoveries' (découvertes) résume des nouvelles plus scientifiques de journaux tels que "Nature" ou "Science" et permet ainsi au lecteur de mettre à jour ses connaissances d'histoire naturelle en quelques minutes.

These pieces are often useful for conservation educators as the journal details new exhibits and includes occasional educational articles.

Reports of projects supported by zoo conservation departments, ABWAK and other organisations are published here. Behaviour enrichment is a common theme in this journal and this makes RATEL an excellent resource for case studies on this increasingly popular subject in zoo conservation education. ABWAK also has a website that features some articles.
http://www.abwak.co.uk

The World Zoo Conservation Strategy: The Role of the Zoos and Aquaria of the World in Global Conservation
IUDZG- The World Zoo Organization and The Captive Breeding Specialist Group of IUCN/SSC Sept 1993. Copies available from CBSG, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124-8199 USA. $3 required for postage and packing. The executive summary may be found in pdf format on Brookfield Zoo's website www.brookfieldzoo.org

The first publication of this strategy is an encouraging document that links zoos and other conservation organisations. It is essential reading for all zoo staff and conservation educators. The second edition is currently in the final stages of production. The strategy summarises the role of zoos in in situ and ex situ conservation, education and research, and highlights the importance of current zoo networks.

La asociación para la protección de animales silvestres en Gran Bretaña publica la revista RATEL cada dos meses. Incluye artículos, cartas y reseñas de interés para los miembros de la asociacion. Estas contribuciones son generalmente útiles para educadores de la conservación, debido a que RATEL ofrece frecuentemente detalles de nuevas exposiciones e incluye ocasionalmente artículos educacionales.

Se publican también articulos sobre proyectos apoyados por los departamentos de conservación del zoológico, ABWAK y otras. Enriquecimiento del comportamiento es un tema común de esta revista y hace que RATEL sea excelente recurso para estudios particulares en este tema cada vez más popular que es la educación de la conservación en un zoológico. ABWAK tiene también una página web con algunos artículos sobre estos temas.
http://www.abwak.co.uk

La estrategia mundial de conservación de los Zoológicos: El papel de los zoológicos y acuarios del mundo en conservación global.
IUDZG- La organización mundial de Zoológicos y el grupo especializado en reproducción de animales en cautiverio IUCN/SSC, septiembre 1993. Copias de este libro se encuentran a disposición solicitándolas a CBSG, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124-8199 USA.
Se necesitan $3 para cubrir el empaquetado y envió. El resumen ejecutivo se puede consultar en formato pdf en la página Web de el Zoológico Brookfield
www.brookfieldzoo.org

La primera publicación de esta estrategia es un documento muy motivador que une a los zoológicos con otras organizaciones dedicadas a la conservación. Esta es una lectura indispensable para el personal del zoológico y los educadores en la conservación. La segunda edición de la misma se encuentra casi lista.

La estrategia resume el papel que juegan los zoológicos en las actividades de conservación in situ y ex situ, educación e investigación y

RATEL
Association of British Wild Animal Keepers. Darren McGarry, ABWAK membership, Edinburgh Zoo, 134 Corstorphine Road, Edinburgh, EH12 6TS
ISSN 0305-1218.
Souscription annuelle £14 - £22.

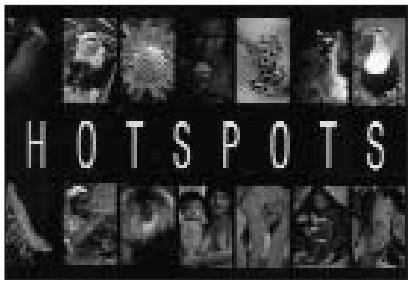
"RATEL" est publié tous les deux mois par l'association des gardiens d'animaux sauvages britanniques (Association of British Wild Animal Keepers (ABWAK)) et contient des articles, des lettres et des récensions à l'intention du personnel soignant. Cependant, ces textes peuvent être utiles aux éducateurs en conservation, comme le journal donne souvent des détails sur de nouvelles expositions et inclut de temps en temps des articles éducatifs

Les rapports de projets soutenus par les départements de conservation des zoos, ABWAK et par d'autres organisations sont publiés ici. L'enrichissement du comportement est un thème communément abordé dans ce journal et cela fait de RATEL une excellente ressource pour des études de cas sur ce sujet de plus en plus à la mode pour l'education à la conservation des zoos. ABWAK a aussi un site Internet qui présente quelques articles: http://www.abwak.co.uk

The World Zoo Conservation Strategy: The Role of the Zoos and Aquaria of the World in Global Conservation
IUDZG- The World Zoo Organization and The Captive Breeding Specialist Group de IUCN/SSC Sept 1993. disponible auprès de CBSG, 12101 Johnny Cake Ridge Road, Apple Valley, MN 55124-8199 USA moyennant 3$ pour frais d'envoi. Le texte peut aussi être téléchargé en format PDF à partir du site du zoo de Brookfield: www.brookfieldzoo.org

La première publication de cette stratégie est un document encourageant qui relie les zoos avec d'autres organisations de conservation. C'est une lecture indispensable pour tout personnel de zoos et les éducateurs en conservation. La seconde édition est actuellement en phase finale de production.

Chapter 4 is dedicated to education. It discusses the huge potential zoos have to educate hundreds of millions of people all over the world through informal and formal interpretation either on site or as outreach programmes.



Hotspots: Earth's biologically richest and most endangered terrestrial ecoregions (1999). Mittermeier, R.A., Myers, N., Robles Gill, P., Mittermeier, C.G. Conservation International. ISBN 9686397582. $67.95. Difficult to buy new but used books are available on websites such as Amazon.

Only 1.4% of the Earth's land surface is home to 60% of species. In this large book, 25 of these terrestrial 'hotspots' are analysed by more than 100 specialists. 358 first-class photographs serve to highlight the significance of conservation of these threatened areas. The text deals with the concepts of endemism, biodiversity and hotspots- a term pioneered by ecologist Norman Myers.

In over 50 tables, hotspots are ranked by species diversity and species endemism. For conservation educators, this book also gives comprehensive coverage of the places that are often referred to yet may not be fully understood such as Madagascar and the Atlantic Forest of South America. Each hotspot chapter details flagship species, threats to species, current conservation activities and future conservation needs.

Websites

http://www.zooreach.org/
The Zoo Outreach Organization describes themselves as 'Friends of the Zoo' for South Asian zoos and people active in field studies and conservation. ZOO was founded by Sally Walker in 1985 and is associated with the Species Survival Commission of the IUCN.

hace destacar la importancia de las interconexiones actuales de los zoológicos.

El capitulo 4 esta dedicado a la educación. Aquí se discute el gran potencial de los zoológicos para educar formal e informalmente a millones de gente de todo el mundo ya sea en el mismo zoológico o con programas fuera de este.

Hotspots: las ecoregiones biológicas más ricas y amenazadas del planeta (1999). Mittermeier, R.A., Myers, N., Robles Gill, P., Mittermeier, C.G. Conservación Internacional. ISBN 9686397582. $67.95. Difícil de obtener como libro nuevo, sin embargo se puede conseguir usado a través de Internet en websites como Amazon.

Solo en un 1.4% de la superficie de la tierra se alberga el 60% de las especies. En este inmenso libro, 25 de los principales 'hotspots' son analizados por más de 100 especialistas. Se incluyen 358 fotografías de extraordinaria calidad para hacer resaltar la importancia de la conservación en estas áreas amenazadas. El texto aborda los conceptos de endemismo, biodiversidad y hotspots-como fue usado por primera vez por el ecólogo Norman Myers.

En unas 50 tablas, estos 'hotspots' son catalogados de acuerdo al numero de especies, diversidad y endemismos. Para educadores en la conservación, este libro proporciona una cobertura global de los lugares que son frecuentemente mencionados y que no han sido completamente estudiados como son: Madagascar y el bosque atlántico de Sudamérica. Cada capitulo de 'hotspot' detalla especies representativas típicas, sus amenazas, su estado actual, actividades para su conservación y las necesidades de las mismas para asegurar su futuro.

Websites

http://www.zooreach.org/
La Organización para ayuda de los Zoológicos (Z.O.O.) se describe como "Amigos de los Zoológicos" para los parques zoológicos del Sur de Asia y la gente activa en estudios de campo y conservación. Z.O.O. fue fundada por

La stratégie résume le rôle des zoos dans la conservation in situ et ex situ, dans l'éducation et dans la recherche et accentue l'importance des réseaux actuels de zoos.

Le chapitre 4 est dédié à l'éducation. Y est discuté le très large potentiel qu'ont les zoos pour éduquer des centaines de millions de gens de par le monde à travers l'interprétation formelle et informelle aussi bien sur leurs sites que par des programmes extérieurs.

Hotspots: Earth's biologically richest and most endangered terrestrial ecoregions (1999). Mittermeier, R.A., Myers, N., Robles Gill, P., Mittermeier, C.G. Conservation International. ISBN 9686397582. $67.95. Difficile à trouver neuf, mais des livres d'occasion sont proposés sur des sites tels que Amazon.

Seulement 1.4% de la surface terrestre abrite 60% des espèces. Dans ce grand livre, 25 des ces 'hotspots' sont analysés par plus de 100 spécialistes. 358 photographies de première qualité servent à accentuer l'importance de conserver ces zones menacées. Le texte traîte des concepts d'endémisme, biodiversité et hotspots – un terme forgé par l'écologiste Norman Myers.

Dans plus de 50 tables les hotspots sont ordonnés selon la diversité et l'endémisme des espèces. Pour les éducateurs de conservation, ce livre renseigne aussi de façon compréhensible sur les endroits qui sont souvent mentionnés, mais éventuellement pas toujours bien compris, comme Madagascar et la Forêt Atlantique de l'Amérique du Sud. Chaque chapitre hotspot donne le détail des espèces phares, des menaces pour les espèces, des activités de conservation actuelles et des besoins de conservation futurs.

Sites Internet

http://www.zooreach.org/
L'organisation Zoo Outreach se décrit elle-même comme étant des "Amis du zoo" pour les zoos d'Asie du Sud, des gens actifs dans des études de terrain et dans la conservation. Z.O.O. fut fondé par Sally Walker en 1985 et est associée à la Comission de Survie des espèces de la UICN.

The indices for their two publications ZOOS' Print (zoo and wildlife articles and notes) and ZOO ZEN (old and out of print articles on single subjects such as enclosure design) are on the site. A list of useful resources for educators includes interactive links that take you to documents on interpretation and conservation, and include 'Developing an education programme around a species or event', and 'How to be creative in 10 easy lessons'.

http://www.enchantedlearning.com
Enchanted Learning produces children's educational and fun web sites and games that are designed to be used by all. For educators this website gives ideas on family-friendly interpretation and how to simplify complex biological terms.
After submitting the term 'tree fern' in this site's search engine it came up with 17 educational resources that describe and simply illustrate tree ferns. The resources are in a range of forms; glossaries based on habitat or subject, quizzes and picture dictionaries (these come in a variety of languages). Other searches may throw up print-outs of map outlines, life cycles and anatomy.

http://www.izea.net/
The European Zoo Educators (EZE) meet every two years, and these have recently been held in co-operation with every other EAZA conference. The British and Irish Zoo Educators (BIZE) meet annually and hold more frequent regional meetings.

The independent Zoo News Digest is an e-newsletter run up by editor Peter Dickinson. It gives access to new zoo-related stories and lists job vacancies. Email: Peter@elvinhow.prestel.co.uk

Resources selected and reviewed by Claudy Fox, Education Officer at Bristol Zoological Gardens, Clifton, Bristol, UK. www.bristolzoo.org

Sally Walter en 1985 y esta asociada con la Comisión para la Sobrevivencia de especies de la IUCN.

Los índices de sus dos publicaciones impresas ZOOS' (zoológicos y artículos y notas sobre vida silvestre) y ZOO ZEN (artículos viejos sobre temas únicos, así como diseño de albergues) se encuentran en el sitio. Una lista de recursos útiles para educadores incluye enlaces interactivos que conducen a documentos sobre interpretación y conservación, como 'Desarrollando un programa de educación alrededor de una especie o evento', y 'Como ser creativo en 10 lecciones fáciles'.

http://www.enchantedlearning.com
Enchanted learning produce websites educativos para niños y juegos que son diseñados para ser usados por todas las personas. Para los educadores, este sitio web da ideas sobre interpretación para la familia y también de como simplificar términos biológicos complejos.

Después de someter el término 'tree fern' (helecho arborescente) en este sitio, se obtuvieron 17 recursos educativos que describen e ilustran sencillamente los helechos arborescentes. Estos recursos están en rango de formas; glosarios basados sobre habitat o tema, juegos y diccionario de pinturas (estas vienen en una variedad de idiomas). Otras búsquedas pueden arrojar impresiones de mapas, ciclos de vida y anatomía.

http://www.izea.net/
Los Educadores de Zoológicos en Europa (EZE) se reúnen cada dos años, y estos han recientemente sido albergados en otras conferencias a través de la cooperación de EAZA (European Asociation of Zoos and Aquaria). Los Educadores de Zoológicos Británicos e Irlandeses (BIZE) se reúnen anualmente y organizan reuniones regionales más frecuentemente.

El boletín independiente Zoo News Digest es un boletín electrónico editado por Peter Dickinson. Este da acceso a nuevas historias relacionadas con zoológicos y a una lista de vacantes para empleos.
Email: Peter@elvinhow.prestel.co.uk

Les index de leurs deux publications ZOOS' Print (articles et notes sur les zoos et la vie sauvage) et ZOO ZEN (articles anciens et hors impression sur des sujets uniques, p. ex. la conception de clôtures) sont sur le site. Une liste de liens utiles pour les éducateurs comporte des liens interactifs qui vous mènent vers des documents sur l'interprétation et la conservation et incluent 'Developing an education programme around a species or event' (développer un programme éducatif autour d'une espèce ou d'un événement) et 'How to be creative in 10 easy lessons' (Comment être créatif en 10 leçons faciles).

http://www.enchantedlearning.com
Enchanted Learning produit des sites web éducatifs et ludiques pour enfants et des jeux déstinés à tous. Pour des éducateurs, ce site donne des idées sur l'interprétation se prétant aux familles et la simplification des termes biologiques complexes.
En introduisant le terme 'tree fern' (fougère arborescente) dans le moteur de recherche de ce site, il retourne 17 liens vers des pages éducatives qui décrivent et illustrent simplement les fougères arborescentes. Ces pages se présentent sous une variété de formes; glossaires basés sur l'habitat ou le sujet, des devinettes et des dictionaires d'images (dans une variété de langues). D'autres recherches peuvent retourner des pages prêtes à imprimer avec des esquisses de cartes, de cycles de vie ou d'anatomie.

http://www.izea.net/
Les éducateurs de zoos européens (EZE) se réunissent tous les deux ans et ces réunions ont récemment été tenues en coopération avec chaque deuxième conférence EAZA. Les éducateurs de zoos britanniques et irlandais (BIZE) se réunissent annuellement et ont des réunions régionales plus fréquentes.

Le Zoo News Digest indépendant est une lettre d'information électronique distribuée et éditée par Peter Dickinson. Elle donne accès à des sujets reliès aux zoos et liste des emplois vacants. Email: Peter@elvinhow.prestel.co.uk

How to join Botanic Gardens Conservation International

The mission of BGCI is to build a world network for plant conservation. It was founded in 1987 and now includes over 525 member institutions in 115 countries, working together to implement the *International Agenda for Botanic Gardens in Conservation* and the new *Global Strategy for Plant Conservation*.

Institutions can join BGCI for the following benefits:

- Membership of the worldwide plant conservation network
- Botanic Garden Management Resource Pack (upon joining)*
- Regular publications:
  - the regular newsletter, *Cuttings*
  - *BGjournal* – an international journal for botanic gardens (2 per year)
  - *Roots* - environmental education review (2 per year)
  - A wide range of new publications
- Invitations to BGCI congresses and discounts on registration fees
- BGCI technical support and advisory services

	Institution Membership	£ Stlg	US $	£ Euros
A	BGCI Patron Institution	5000	7500	7500
B	Institution member (budget more than US$2,250,000)	600	940	940
C	Institution member (budget US$ 1,500,000 - 2,250,000)	440	660	660
D	Institution member (budget US$ 750,000 - 1,500,000)	300	440	440
E	Institution member (budget US$ 100,000 - 750,000)	160	220	220
F	Institution member (budget below US$100,000)*	75	110	110
	**Generally applies to institutions in less developed countries*			

Other Membership Categories:

Membership benefits depend on category - see below. These can include:

- Regular publications:
  - the regular newsletter, *Cuttings*
  - *BGjournal* - an international journal for botanic gardens (2 per year)
  - *Roots* - Environmental Education Review (2 per year)
- Invitations to BGCI congress and discounts on registration fees

	Corporate Membership	£ Stlg	US $	£ Euros
G	Corporate Gold Member (*BGjournal*, *Roots* and *Cuttings* plus more)	5000	7500	7500
H	Corporate Silver Member (*BGjournal*, *Roots* and *Cuttings* plus more)	1000	1500	1500

	Individual Membership	£ Stlg	US $	£ Euros
J	Conservation donor (*BGjournal*, *Roots* and *Cuttings* plus more)	160	220	220
K	Associate member (*Cuttings* and *BGjournal*)	35	50	50
L	Associate member (*Cuttings* and *Roots*)	35	50	50
M	Friend (*Cuttings*) available through online subscription only (www.bgci.org)	10	15	15

*Contents of the Botanic Garden Management Resource Pack: *The Darwin Technical Manual for Botanic Gardens, A Handbook for Botanic Gardens on the Reintroduction of Plants to the Wild, A CITES Manual for botanic gardens, BGjournal - an international journal for botanic gardens (2 past issues), Roots - environmental education review (2 past issues), The International Agenda for Botanic Gardens in Conservation, Global Strategy for Plant Conservation, Environmental Education in Botanic Gardens, BG-Recorder (a computer software package for plant records).*

Payment may be made by cheque payable to Botanic Gardens Conservation International,or online at www.bgci.org or by VISA/Mastercard sent to BGCI, Descanso House, 199 Kew Road, Richmond, Surrey, TW9 3BW, U.K or Fax: +44 (0) 20 8332 5956.

❑ I wish to apply for membership of Botanic Gardens Conservation International.

Name . . . . . .
Telephone . . . . . .
Address . . . . . .
. . . . . .
Fax . . . . . .
E-mail . . . . . .
Internet site . . . . . .

Membership category . . . . . Annual rate . . . . . .
VISA/Mastercard number . . . . . Credit card expiry date . . . . . .
Signature . . . . . Print name . . . . . .

❑ I would like to make a donation to BGCI. Amount . . . . . .

Please clearly state your name (or the name of your institution) on all documentation. Please contact info@bgci.org for further information.

Botanic Gardens Conservation International

Descanso House, 199 Kew Road,
Richmond, Surrey, TW9 3BW, U.K.

Tel: +44 (0)20 8332 5953
Fax: +44 (0)20 8332 5956
E-mail: info@bgci.org
Internet: www.bgci.org

This publication is supported through *Investing in Nature*

A partnership between BGCI, Earthwatch, HSBC and WWF

Investing in Nature

HSBC

Printed on 100% recycled paper

ISSN 0965-2574