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

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

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

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

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

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

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

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

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

IUCN Technical Guidelines

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

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

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

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

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

Conclusions

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

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

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

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References

Anon. (2004). Strategic framework and action plan for the African Botanic Garden Network 2002-2010. *Southern African Botanical Diversity Network Report* 22: 59-67.

Botanic Garden Conservation International (2001). *Botanic Garden Agenda for Conservation*. London: Botanic Gardens Conservation International.

Cohn, J.P. (2000). Working outside the box: zoos and aquariums are shifting the focus of their conservation efforts to the wild. *BioScience* **50 (7):**564-569.

Ebenhard, T. (1995). Conservation breeding as a tool for saving animal species from extinction. *Trends in Ecology and Evolution,* **10,** 438-443.

Gippoliti, S. and G.M. Carpaneto (1997). Captive Breeding, Zoos, and Good Sense. *Conservation Biology,* **11** (3), 806-807.

Glowka, L., F. Burhenne-Guilman, H. Synge, J. A. McNeely, and L. Gündling. (1994). *A Guide to the Convention on Biological Diversity.* Environment Policy and Law paper No. 30. Gland, Switzerland: IUCN.

Guerrant, E.O., K. Havens and M. Maunder (eds). (2004). *Ex Situ Plant Conservation: Tools for Conserving Wild Populations.* Island Press, Washington, USA.

Holst, B. (2003). European zoos support the Atlantic Rainforest. *Oryx,* **37 (1)**, 14-15.

Husband, B.C. and Campbell, L.G. (2004). "Population responses to novel environments: Implications for *ex situ* plant conservation" In *Ex Situ Plant Conservation: Tools for Conserving Wild Populations.* (Eds. E.O. Guerrant, K. Havens and M. Maunder) pp 231-266. Island Press, Washington, USA.

IUCN. (1987). *Captive Breeding Policy. IUCN Policy Document.* Gland. Switzerland. (http://www.iucn.org/themes/ssc/pubs/pubs/policy/capte.htm)

IUCN, (2002). *IUCN Technical Guidelines on the Management of Ex Situ Populations for Conservation.* Gland, Switzerland. (http://www.iucn.org/themes/ssc/pubs/policy/exsituen.htm)

IUDZG/CBSG IUCN/SSC. (1993). *The World Zoo Conservation Strategy: The Role of Zoos and Aquaria of the World in Global Conservation.* Brookfield, IL: Chicago Zoological Society.

Joron, M. & Brakefield, P.M. (2003). Captivity masks inbreeding effects on male mating success in butterflies. *Nature,* **424,** 191-194**.**

Lindsay Oaks, J., Gilbert, M., Virani, M.Z., Watson, R.T., Meteyer, C.U. Rideout, B.A., Shivaprasad, H.L., Ahmed, S., Chaudhry, M.J.I., Arshad, M., Mahmood, S., Ali, A., & Khan, A.A. (2004). Diclofenac residues as the cause of vulture population decline in Pakistan. *Nature,* **427**, 630-633.

Mace, G.M., Pearce Kelly, P. and Clarke, D. (1998). An integrated conservation program for the tree snails (Partulidae) of Polynesia: a review of captive and wild elements. *Journal of Conchology* S2, 89-96.

Maunder, M., Culham, A., Alden, B., Zizka, G., Orliac, C., Lobin, W., Bordeu, A., Ramirez, J.M. & Glissmann-Gough, S. (2000). Conservation of the Toromiro Tree: Case study in the management of a plant extinct in the wild. *Conservation Biology* **14(5),** 1341-1350.

Maunder, M., M. R. Stanley Price, P. Soorae, and Mashuari, S. (2002). "The role of tropical botanic gardens in supporting species and habitat recovery: East African opportunities". In *Plant Conservation in the Tropics: Principles and Experiences*. (Eds. M. Maunder, C. Hankamer, C. Clubbe, and M. Groves) pp 115-134. Royal Botanic Gardens, Kew, UK.

Pence, V.C. (2004). *"Ex situ* conservation methods for bryophytes and pteridophytes" In *Ex Situ Plant Conservation: Tools for Conserving Wild Populations.* (Eds. E.O. Guerrant, K. Havens and M. Maunder) pp 206-227.

Reichard, S.H. and White, P.S. (2001). Horticulture as a pathway of invasive plant introductions in the United States. *BioScience,* **51,** 103-113.

Snyder, N. F. R., S. R. Derrickson, S. R. Beissenger, J. W. Wiley, T. B. Smith, W. D. Toone, and Miller,B. (1996). Limitations of captive breeding in endangered species recovery. *Conservation Biology,* **10,** 338-348.

Stanley Price, M.R., M. Maunder, and Soorae, P.S. (2004). *"Ex situ* support to the conservation of wild populations and habitats: Lessons from zoos and opportunities for botanic gardens" In *Ex Situ Plant Conservation: Tools for Conserving Wild Populations.* (Eds. E.O. Guerrant, K. Havens and M. Maunder) pp 84-110. Island Press, Washington, USA.

Westley, F.R. & Miller, P.S. (eds) (2003). *Experiments in Consilience: Integrating social and scientific responses to save endangered species*. Island Press, Washington, USA.

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