CBSG News

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Volume 11
Number 1
September 2000

Newsletter of the Conservation Breeding Specialist Group, Species Survival Commission, World Conservation Union

CBSG's Core Competencies: Past, Present and Future Directions

The PHVA, CAMP, and organizational Conservation Futures workshop summaries described in these pages illustrate the continuing development of CBSG workshop processes. The scope of application now extends well beyond risk analysis (identification, quantitative assessment and management of risk) for individual populations and species. This classical process now includes intensive engagement of multiple stakeholders, regardless of language and educational backgrounds, in the development of real actions that they have identified and agreed to help implement. The number of institutions represented number in the hundreds and the numbers of individuals participating in the thousands. Evidence is growing, from scientific studies and anecdotal evidence, that there are multiple enduring long-term effects of this kind of workshop process reflected particularly in new collaborations and recognition of new knowledge needs.

Successful development of a CAMP data entry, recording and analysis software program means that this process will now be able to achieve synthesis of information across countries and taxa and make this information more readily available to our constituencies for use in their planning processes. Linkages have been developed with the new IUCN Red Listing process so that, where appropriate, candidate species can be entered in the global Red List on a regular basis. It is also planned to link this program to other software that the Species Survival Commission is developing. The program has been translated into Spanish, allowing more effective utilization in Latin America, and is being translated into French for use in Francophone countries. It is our hope to extend the use of the program for national biodiversity assessments.

There is a continuing emphasis on training, both in the course of CAMP and PHVA workshops to transfer CBSG tools and in separate events to implement recommendations coming from these workshops. Implementation is based on coordination of the resources of collaborating institutions to achieve results wanted by the range country. This has been greatly developed in the workshop programs and biomedical surveys for the captive giant panda population working with Chinese colleagues on projects they identified in several workshops.

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The recent application of the workshop process to organizational conservation planning and futures searches has been expanding rapidly as zoos move to develop institution-wide conservation cultures and strive to increase their linkages to *in situ* conservation activities and research. This process has also found a niche with other conservation organizations as they seek to work toward increasingly complex and uncertain futures.

CBSG is responding to the growing needs of our captive and wildlife constituencies through the development of new tools to expand the scope and capability for risk analysis and management planning. These include the development of a practical disease risk analysis tool kit for application to planned animal transfers to avoid the stultification of a zero-risk position but to make transparent and quantitative estimates of the risks involved so that defendable decisions can be made. The modeling tools are being expanded, and a Windows version of VORTEX is being developed, with greater capabilities and user accessibility. We have made progress in incorporating information on local human population projects and land use pattern effects into the assessment process, and work is continuing on this very complex multidisciplinary effort. We are optimistic that we are developing practical tools that can be applied by local managers to enhance their capability to manage and conserve biological diversity at the local level with the engagement of the local populations and managers in a sustained shared responsibility for their own ecosystems.

Ulysses S. Seal, CBSG Chairman

In Memoriam

Arlene Kumamoto, a 25-year employee of the Zoological Society of San Diego and key member of the CBSG Giant Panda Biomedical Survey team, died 10 January 2000 of cancer. She was 47. Ms. Kumamoto, a cytogenetics specialist who worked at the zoo's Center for Research on Endangered Species, was a dedicated researcher for endangered species conservation and served as a member of the AZA Small Population Management Advisory Group. Her work focused on helping to establish self-sustaining populations in zoos and in the wild, and providing lab and field support for research and conservation. Her most recent research efforts focused on paternity and chromosomal studies involving giant pandas. Arlene's warmth, dedication and sparkling smile are deeply missed by all who knew her. She is survived by her husband, Steve Kingswood, her parents, a sister and brother.

Dr. Luis Baptista, Curator of Ornithology and Mammalogy at the California Academy of Sciences, died unexpectedly on 12 June 2000. He was 59. Luis was best known as a scientist who knew song dialects of songbirds from Alaska to Costa Rica and for his conservation work with the Socorro Island dove. For more than 20 years, Dr. Baptista worked with a team of colleagues to study singing behavior in white-crowned sparrows. They documented individual songs in various subspecies of the birds and recorded dialects among birds from different areas. Luis will be remembered not only for his contributions to science and conservation, but for his warm and generous spirit and ear-to-ear grin that he shared so readily. Surviving Dr. Baptista are his partner, Helen Hornblit, his daughter, Laura, his mother and two brothers.

We extend our sympathy to the family and friends of these two exemplary colleagues.

CBSG News

CBSG News is published by the Conservation Breeding Specialist Group, Species Survival Commission, World Conservation Union. *CBSG News* is intended to inform CBSG members and other individuals and organizations concerned with the conservation of plants and animals of the activities of CBSG in particular and the conservation community in general. We are interested in exchanging newsletters and receiving notices of your meetings. Contributions of US $35 to help defray cost of publication would be most appreciated. Please send contributions or news items to:

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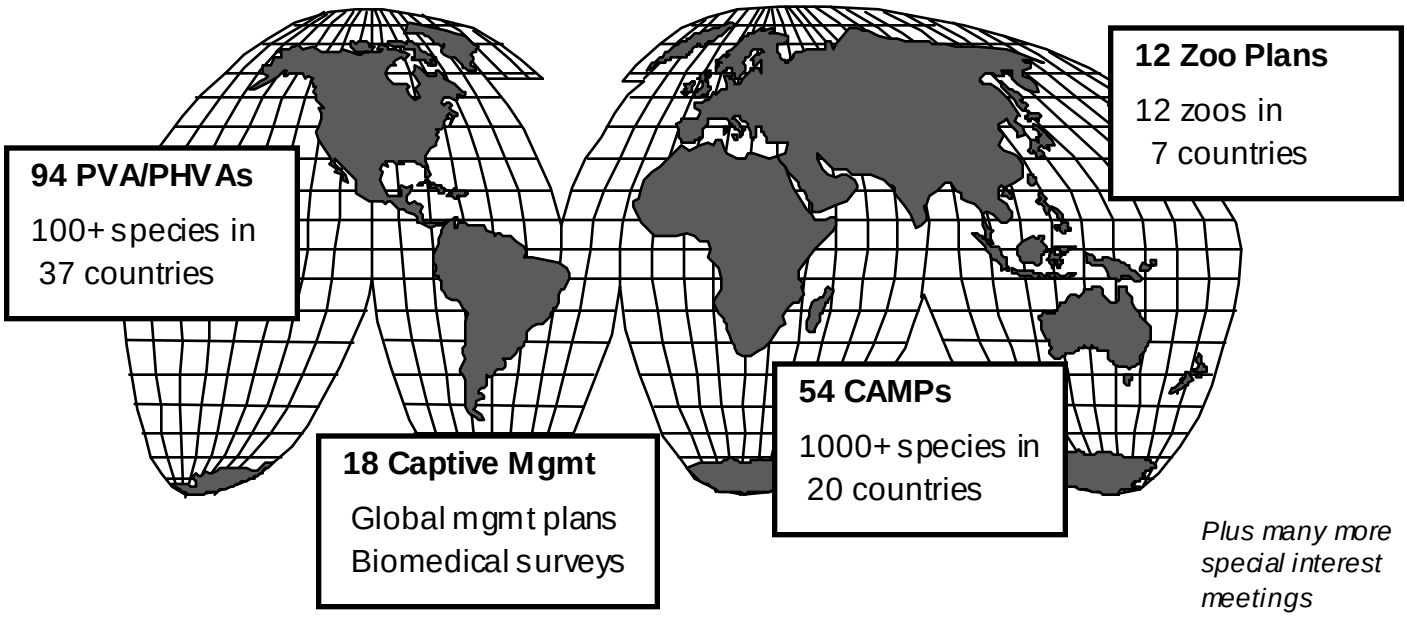
CBSG Mission Statement

The mission of the Conservation Breeding Specialist Group is the conservation or establishment of viable populations of threatened species.

The goals of CBSG are to:

1. Organize a global network of people and resources.
2. Collect, analyze and distribute information.
3. Develop global conservation breeding programs.
4. Integrate management programs for captive and wild populations.

CBSG Activities at a Glance: *A Global Perspective*



More than 200 workshops in 43 countries on 6 continents around the globe.

Since 1989 the Conservation Breeding Specialist Group of the IUCN Species Survival Commission has worked in cooperation with hundreds of government wildlife agencies, zoological associations, universities, and conservation organizations to promote the conservation of biodiversity.

During this time CBSG has assisted in the coordination and facilitation of more than 200 workshops in 43 countries around the world, involving thousands of participants and stakeholders in developing conservation strategies for more than 1000 animal and plant species. Target taxa include all classes of vertebrates as well as invertebrates and plant species. Depending upon the location, workshops and the resulting reports have been available not only in English but also in range country languages such as Spanish, Chinese, Thai, Indonesian, and Pidgin.

Workshops have been varied in focus and breadth. Population and Habitat Viability Assessments (PHVAs) typically focus upon the viability of one species in the wild, while Conservation Assessment and Management Plans (CAMPs) assess the status and needs of a related group of species. A diversity of captive management programs range from biomedical surveys to the development of global captive management strategies. CBSG has assisted several zoos with the development of a broad zoo-wide masterplan and, more recently, with development of an institutional conservation plan.

This issue of *CBSG News* summarizes many of the CBSG-facilitated workshops that took place over the past 18 months. With each passing year CBSG's sphere of involvement expands around the globe.

Red Wolf PHVA

Virginia Beach, VA, USA, April 1999

Photo: Waverley Traylor

The red wolf (*Canis rufus*) once roamed throughout the southeast United States until predator control programs and habitat loss brought it to the brink of extinction. Fourteen wolves, captured by the US Fish and Wildlife Service from 1974 through 1980, formed the nucleus of a captive breeding program before the species disappeared from the wild. Since that time the Red Wolf Recovery Program has succeeded in returning the red wolf to the wild, with a free-ranging population distributed over one million acres in several locations, including one mainland reintroduction site (Alligator River National Wildlife Refuge) and three island propagation sites.

Several critical issues challenge the expansion of this program to meet its recovery goals, including selection of additional restoration sites and assessment and management of hybridization with coyotes. To address these and other management issues, a Population and Habitat Viability Assessment was conducted 13-16 April 1999 in Virginia Beach, Virginia. Forty scientific and management experts in the fields of canid biology, wildlife management, genetics, captive breeding and population modeling attended this workshop. Five primary issues were identified for analysis in working groups: coyote hybridization/ genetic consequences; wild population monitoring; new population site selection; captive population management; and risk assessment modeling. It quickly became clear that hybridization with coyotes was the primary issue driving discussions on red wolf conservation in the Alligator River region and elsewhere in the southeastern U.S. As a result, the working groups emphasized issues related to coyote hybridization and its threat to red wolf viability.

Given the immediate threat of hybridization at the Alligator River site, the selection of new reintroduction sites was postponed. When new sites are considered, it was recommended that they be selected based upon conditions that will assure red wolf genetic stability. This may include areas outside of the red wolf's historic range, and intensive management will likely be required to control genetic integrity.

A simple genetic model was developed to address the consequences of hybridization with coyotes by measuring the rate of loss of red wolf "ancestry" as a function of the frequency of hybridization (i.e., the proportion of total litters that are a result of hybrid matings). Preliminary analysis indicated that estimates of the current rate of hybridization – with as many as 20% of recent litters resulting from hybrid matings – are much higher than those allowed under acceptable loss of ancestry over the next few generations. This model needs immediate refinement to better understand the implications of coyote introgression into the red wolf population.

Given the preliminary model results, biological control of coyotes and hybrids was recommended to prevent coyote gene flow into the red wolf genome until more information is available. Additional recommendations included maximizing the number of releases to maximize red wolf population growth and continued monitoring of red wolf and coyote populations. The ability to genetically identify canids as coyotes, wolves or hybrids (via blood and scat) will be important for management. An evaluation of past canid hybridization within the red wolf historical range may be helpful in assessing potential hybridization in the Alligator River area.

It became clear during the workshop that the role of the captive population in the recovery of red wolves is increasingly important. Hybridization of free-ranging red wolves with coyotes means that the captive population is the only repository of the original genetic composition of the species. Continued infusions of captive-bred wolves will be necessary to maintain hybrid-free populations of red wolves in the wild. Increased captive breeding and expansion of captive facilities emerged as a critical need. Given sufficient funding, captive facilities could also contribute by supporting research to investigate genetic, morphological and behavioral characteristics of red wolf-coyote hybrids.

The Red Wolf Recovery Program has had significant successes over its history, including an effective captive breeding program and a successful reintroduction program. This workshop, however, recognized hybridization in the free-ranging population as a serious threat to the continued success of this landmark program. Because of this threat, the primary recovery focus is the protection and promotion of a self-sustaining, non-hybridizing population of red wolves in the wild and maintenance of a captive population.

African Penguin PHVA

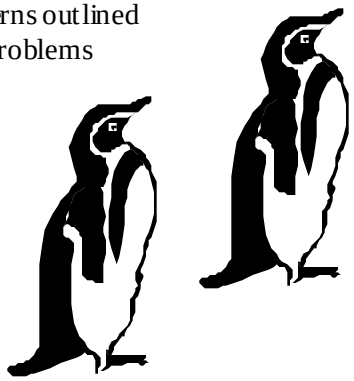
Cape Town, South Africa, April 1999

In 1996, a Conservation Assessment and Management Plan (CAMP) workshop for penguins held in Cape Town, South Africa facilitated a substantive review and updating of an earlier penguin CAMP document, produced in 1992. Twenty-four penguin taxa were evaluated in terms of their current and projected status in the wild, and priorities were set for conservation action. Of all of the penguin species, only those in the Antarctic do not seem to be facing grave, documented declines or other problems that put them at serious risk. Even Antarctic species are facing the same threats that threaten other penguin species.

Of the taxa designated as threatened, the African penguin (*Spheniscus demersus*) is of particular conservation concern. The African penguin's breeding range is from Hollams Bird Island, Namibia to Bird Island, Algoa Bay, South Africa. In the mid-1950s, the overall population was estimated to be about 300,000 adults, which declined to 179,000 by the early 1990s. If the present rate of loss continues, CAMP participants predicted that extinction in the wild will occur within 70 years.

Primary threats to African penguins include competition for food with seals and commercial fisheries, predation by seals, loss of habitat from interspecific competition for nesting sites, and oil spills. Oil spills have a major impact on African penguins, especially when the oil washes ashore at breeding areas. Catastrophic oil spills occur irregularly, but there also is persistent, chronic oiling which accounts for steady, high levels of mortality. There have been seven major oil incidents since the early 1970s in which many penguins were oiled, as well as a great many more minor oiling events. Contrary to experience elsewhere, the cleaning of oiled penguins in southern Africa is relatively effective and has been demonstrated to make a contribution to conservation efforts (see box insert for an account of the latest oil spill).

To address the concerns outlined above as well as other problems facing the species, a PHVA workshop for the African penguin was held in Cape Town, South Africa from 21-23 April 1999. Thirty-five biologists, wildlife managers, researchers and fisheries experts attended the workshop, which was hosted by the BirdLife International Seabird Conservation Programme of the University of Cape Town and was supported by SeaWorld. Participants identified the major issues and concerns affecting the conservation of the African penguin, which became the focus of four working groups.



Colony Management

Several recommendations were made that pertain to habitat management, including excluding other species that compete for space, improving nest site quality, and identifying suitable nesting sites for re-establishing or expanding penguin colonies. Recommendations were also made to restrict tourism and minimize the exploitation of penguins at breeding sites to reduce the negative impacts on wild penguin populations. It was suggested that an advisory body be established to assess research proposals in terms of their conservation significance, and that breeding locations be formally managed by a management plan as well as legally protected by enforcement of existing legislation and increasing staff. Egg and chick mortality may be reduced by restricting or removing terrestrial predators from breeding sites, both on the mainland and on islands. Several recommendations for disease prevention were generated, including the need for quick diagnosis and treatment when disease outbreaks occur.

The working group recognized the need to support the continued survival of wild penguins by maintaining breeding zoo populations that could be used to conduct research, to increase awareness concerning African penguin conservation, and to assist with fundraising. Public awareness can be increased, for example, by training personnel in conservation organizations and tour companies to communicate the conservation needs of the African penguin to a wide range of stakeholders.

Oiling

Issues regarding oiling were prioritized into four main components: prevention, enforcement, rehabilitation, and impact of rescue operations. To prevent oiling events, the working group recommended increasing awareness through media and educational campaign efforts. It also was suggested that incentives /penalties be created and legislation improved to deter potential polluters. Enforcement recommendations included increasing lobbying to sensitize the government to the need for marine resource management and to ensure adequate funding appropriations, improving enforcement of existing legislation, and approaching the private sector, especially oil companies, for financial support to increase staffing and equipment needs.

The process and techniques involved in rehabilitation, including post-release monitoring, need to be investigated in order to ensure that the most effective system is in place. Different rehabilitation techniques need to be scientifically tested, and information on appropriate techniques should be communicated both domestically and internationally. Monitoring of penguin colonies to ensure early detection of oil spills is essential and will require securing funding to hire additional personnel. Finally, awareness of the effects of oiling and the rehabilitation process needs to be raised in order to increase public support of rehabilitation efforts.

To ensure effective management of rescue operations, contingency plans adaptable to all colonies and oil spill scenarios need to be developed, detailing necessary equipment, techniques and procedures to be followed with regard to capture, stabilization and transport, staff training and other factors. These plans need to be continuously tested, adapted and revised.

Predation

In order of priority, predation threats to penguins are seals, gulls, cats, rats, sharks, indigenous terrestrial mammalian predators, mole snakes and dogs. A consultative workshop was recommended to develop a policy and implementation plan to deal with penguin-seal interactions and other predation-related topics. There was consensus that feral cats must be eradicated in locations where feasible or necessary.

There is a considerable need to reduce human disturbance in penguin colonies, which can unsettle

African Penguin Disaster: *The Treasure* Oil Spill

On 23 June 2000, the Panamanian-registered iron ore carrier, *The Treasure*, sank between Dassen and Robben islands, Western Cape, which respectively support the world's largest and third largest colonies of African penguins. It was estimated that at least 500 tons of fuel oil escaped from the hull. Two days later, oil began washing ashore on Robben and Dassen Islands. The timing of the spill could not have been worse – it was the middle of the breeding season and many pairs already had chicks at the nest.

SANCCOB (Southern African National Foundation for the Conservation of Coastal Birds), quickly identified a gigantic warehouse in Cape Town and adapted it to suit the task of holding and cleaning large numbers of birds. Four days after the spill, the first batch of 5,000 birds arrived. By August the facility housed nearly 20,000 of the estimated 23,000 penguins oiled by this spill, approximately one-twelfth of the global population. An additional 3,500 penguins are held at a smaller SANCCOB facility on the outskirts of Cape Town.

Penguins were rehydrated and evaluated before cleaning. Those not strong enough to withstand cleaning were placed in "pre-wash rehabilitation" to build up strength. Stronger birds were cleaned as soon as possible. Each bird took two people one hour to clean. An average of 400-500 birds were washed every day, with an anticipated termination of processing by early-mid September. Additionally, several thousand chicks whose parents had been oiled are being hand-reared at the facility.

This enormously labor-intensive and time-consuming process was undertaken by SANCCOB, with support from International Fund for Animal Welfare, World Wildlife Fund, and a broad base of volunteers in South Africa. More than 23 zoos and aquaria from around the world sent staff for 2-4-week stays to assist in the endeavor. This large-scale assistance of zoos in such an emergency recovery effort for a wild population is unprecedented. CBSG congratulates all of the institutions that participated in this initiative, and encourages anyone with an interest to become involved. SANCCOB can be contacted at: sanccob@wine.co.za.

nesting birds and thereby expose eggs and chicks to predation by gulls. Several methods were recommended to address this problem, including campaigns to create awareness of problems, improving human refuse disposal and minimizing fisheries by-catch and disposal. There also is a need to determine whether gull populations can and should be directly controlled.

Primary threats to African penguins include competition for food with seals and commercial fisheries, predation by seals, loss of habitat from interspecific competition for nesting sites, and oil spills.

Fisheries Issues

This working group focused on issues related to food availability for penguins, competition from other predators, penguin/fishery interactions, and the use of fish abundance as an estimator of carrying capacity for the penguin populations. Several actions were recommended with respect to the availability of sufficient food. These primarily focused on refining knowledge of the food requirements (e.g., energy content of prey, energy costs of predation) and foraging areas of the current and projected penguin populations, and understanding prey population demographics. The implications of changing management strategies on commercial fisheries needs to be determined, as well as setting up a model for adaptive management to test the effects of a fisheries exclusion zone. The interactions between penguins and other predators of small pelagic fish needs to be modeled in order to predict their potential effect on the penguin population.

Considering the importance of minimizing penguin mortality through direct fishery interactions (e.g., entanglement in nets, incidental mortality by longlines), it will be important to accurately identify the fisheries where such direct interactions occur. Management options then should be identified and implemented and, if needed, legislation modified.

Monitoring and Modeling

The threats affecting African penguin survival were reviewed and ranked in order of priority: fishery interactions; colony management; predation; oiling; multi-species approach; disease; global climate change; fire; human disturbance and exploitation; and other issues pertaining to modeling. Given the lack of robust demographic parameters for different colonies or regions and the limit on maximum population size by an individual-based model like VORTEX, a single colony was chosen as the appropriate spatial scale to model, initially using parameters from Robben Island as the best-known colony in terms of demography. Models were developed for three levels of juvenile survival, two levels of adult survival, three levels of reproductive success and four scenarios with respect to catastrophes.

One priority is the need to develop specific goals for monitoring programs, guided by the modeling exercise (for example, modeling indicated that age at first breeding is not as important as juvenile and adult survival). Various monitoring needs were identified: follow-up on re-sightings; pooling relevant parameter data both from South Africa and Namibia; developing a written protocol for fieldwork to ensure data accuracy and collection of critical data; and obtaining funding to enter into a computer database all penguin ringing data (~50,000 records) to provide more accurate survival estimates. It also was noted that any protocols for methodology should be consistent yet flexible enough to allow for colony-specific needs (because of island differences). Additionally, stronger emphasis needs to be placed on obtaining critical information on Namibian colonies. Other discussions centered on acquiring specific data that is desirable from ongoing monitoring efforts, such as general monitoring requirements including collection of potential covariates of breeding productivity and survival, and publication of results both in a Penguin Monitoring Handbook and on an annual basis.

Summary

To date, a formal comprehensive action plan for the conservation of this species does not exist. The document that resulted from this workshop is an important starting point that can be used by managers and scientists in southern Africa, setting directions and priorities for management and research, catalyzing conservation actions, and assisting with funding endeavors. It also will serve as a model for similar processes for other species of penguins identified as requiring PHVAs by the 1996 CAMP workshop and/or for other species in the region.

Submitted by Susie Ellis (CBSG), Bob Lacy (Chicago Zoological Society), Les Underhill and Phil Whittington (Avian Demography Unit, University of Cape Town).

Desert Bighorn Sheep PHVA

Santa Fe, NM, USA, July 1999

In earlier times, desert bighorn sheep (*Ovis canadensis mexicana*) probably occurred in most of the arid mountain ranges throughout southern and central New Mexico. By the early 1900s, most populations were driven to extinction through indiscriminate hunting by humans as well as by competition and novel diseases following the introduction of domestic livestock. Only two remnant populations remained by 1955. In 1980, New Mexico declared the subspecies as Endangered within its borders under the state's Wildlife Conservation Act.

By 1989 the population had increased to 130 individuals scattered among four free-ranging populations. In addition, a number of animals were held at the Red Rock captive breeding facility in southwestern New Mexico. Animals from this facility were used to initiate new wild populations, with an estimate of 220 wild sheep among seven populations in 1999. Despite this appearance of success, most of the populations were highly dependent upon continued supplementation from the captive herd and could not be considered self-sustaining. Competing public interests with respect to New Mexico's land resources and increasing human pressure to utilize fragile desert environments have conspired to threaten each wild population with extinction. Over the last few years, new problems have arisen: recruitment of females in captivity dropped dramatically as the birth ratio became more skewed toward males, and mountain lions began taking a heavier toll upon free-ranging animals.

In response to this growing crisis, the New Mexico Department of Game and Fish invited CBSG to conduct a PHVA in order to assist the recovery of the state's desert bighorn sheep population. The Turner Endangered Species Fund generously offered to sponsor the event. The workshop drew 30 participants from seven western U.S. states and the Republic of Mexico. Following background presentations on the history of desert bighorn conservation in New Mexico, the participants worked collectively to identify the major issues and concerns affecting the future of the subspecies in the state. These issues ultimately centered around three broad topics, which then became the focus of the working groups: threats to population survival, population modeling, and sheep management.

Increasing mountain lion predation was identified as the most pressing threat to the short-term survival of desert bighorn in New Mexico. Interestingly, the increase in mountain lion density appears to be closely linked to broad habitat modification that provides more cover from which to attack bighorn. There are three principal approaches to managing the effects of lion predation: reduce the number of predators, manipulate bighorn habitat to enhance visibility and reduce cover for predators, and/or increase the prey: predator ratio which may reduce predation on bighorn. In addition to predation, disease (especially scabies) is a significant problem in selected sheep populations. Introduced exotic ungulates may be responsible for the appearance of many novel diseases.

Significant emphasis at this workshop was placed on demographic viability modeling. Using the best available estimates of population demographic parameters for the free-ranging populations, a set of simulation models was constructed to assess desert bighorn population viability under current and proposed environmental conditions. Under current conditions, subpopulations as well as metapopulations show significant risks of extinction over a 100-year timeframe. This is most likely attributable to significant levels of predation by mountain lions. As little as 5% additional mortality can drive a population toward extinction. Models suggest that the captive population is highly unstable demographically as a result of the extreme male-biased sex ratio among lambs. The cause of this bias should be identified and remedied.

Results from the modeling efforts clearly pointed toward the need to adequately monitor sheep population demographics and habitat use, and also to document inter-mountain movements of individuals within metapopulations. There is a need to increase the general health and productivity of the Red Rock captive herd, and to maximize post-release success through the consideration of pre-release predator control, sheep conditioning to avoid predators, and/or the identification of ideal habitat for releases.

Submitted by Phil Miller, CBSG.

Golden Monkey PHVA

Fanjingshan Reserve, China, October 1999

The Fanjingshan Reserve is home to the only remaining population of the Guizhou golden (snub-nosed) monkey *Rhinopithecus brelichi*. Intensive fieldwork during 1988-93, including a year-round census, provided information on the distribution and density of the species that has not been systematically updated since. This reserve is under pressure from proposed increases in tourism; conversely, there are plans to remove four villages from the core area of the monkey's range. A captive colony was established in 1993 with seven wild-caught animals as founders. Although there has been successful breeding each year since 1995, no studbook existed to guide the management of the captive population. Likewise, a population model had not been developed for the wild population for this species.

Fanjingshan Reserve and Guizhou provincial forestry officials had expressed a strong interest in analyzing the available information on the status of the Guizhou golden monkey and suggesting management recommendations. This interest led to the development of the Guizhou Golden Monkey PHVA Workshop held in October 1999 at the Pan xi Field Station at the Fanjingshan Nature Reserve. Participants included individuals who had participated in the survey work and who were responsible for the captive colony as well as reserve and local forestry officials.

Prior to the workshop a small group of participants reviewed the available information on the survey and census studies conducted from 1988-1993. Information on the sex and age composition of groups observed during the census was tabulated, which provided fundamental information for population modeling. Also reviewed was the distribution information, largely limited to 1993 and earlier. Preliminary information on human occupancy of the reserve core area and buffer was collected.

After discussing the major issues impacting the Guizhou golden monkey, three working groups were formed: Population Modeling, Threats and Management of the Reserve, and Captive Population Management. The interaction between the Modeling and Threats and Management groups led to agreement on risk and management scenarios for further analysis. Information on inter-birth interval, return to reproduction after loss of an infant, and age of first reproduction from the captive colony and the literature provided essential information for population modeling.

Population Modeling

Simulation model results suggest that total population size and proportion of females breeding have a substantial effect on population viability. Census and group composition data over multiple years are needed to make an ongoing evaluation of population viability. More accurate estimates of mortality and maximum age of reproduction are also needed for this species.

Diseases from humans and human presence pose a significant threat to the survival of the population in Fanjingshan. Action needs to be taken to reduce this threat, either by reducing human presence or establishing an additional, geographically isolated population of monkeys.

Even in the absence of any external threats, populations smaller than 200 monkeys cannot be considered viable. Locations considered for translocation should set 200 as the minimum carrying capacity during the season of lowest food supply.

Reserve Threats and Management

Recommendations were made to work with local governments and other parties to reduce the negative impacts of tourism, both current and planned, and to support the current plans to relocate residents from the reserve's core area to an outside location. The ecological and regulatory requirements for a translocation program for the golden monkey should be researched with a view to establishing a second population.

Captive Population

Detailed records of the captive colony were available at the workshop and allowed preparation of a complete studbook of the colony since it was established in 1993. Several recommendations were made for the management of this colony, including continued maintenance of the studbook; facility expansion to maintain 20 monkeys; preventative veterinary care; precautionary measures with confiscated animals to reduce the risk of disease transfer; and establishment of research programs for this species.

The results of this workshop will help to plan a more effective management strategy for both wild and captive populations of the Guizhou golden monkey.

Ethiopian Wolf PHVA

Bale Mtns Park, Ethiopia, November 1999

The Ethiopian wolf (*Canis simensis*), also known as the Simien fox, is endemic to the Ethiopian highlands. With fewer than 500 adult individuals surviving, this critically endangered canid survives in only a few mountain pockets; the largest population is found in the Bale Mountains National Park, with smaller populations in Arsi, Menz, Wollo and Gondar. The remaining Ethiopian wolf populations are small, with only one estimated to contain more than 100 wolves. Current threats all are human-induced. The relative importance of these threats has been assessed in each wolf population through a combination of observations, questionnaires and blood sampling of dogs.

In 1997 the IUCN Canid Specialist Group edited a detailed Action Plan for the conservation of the Ethiopian wolf, resulting in the establishment of the Ethiopian Wolf Conservation Programme. To address the complex problems facing this species, a Conservation Strategy Workshop was held at Bale Mountains National Park from 18-21 November 1999. Sixty-eight people from eight countries attended the workshop, which was a collaborative effort of the Ethiopian Wolf Conservation Programme, the IUCN Canid Specialist Group, and the Wildlife Conservation Research Unit, with support from the Cincinnati Zoo, the Zoological Society of San Diego and the Born Free Foundation (UK). The primary aim of the workshop was to develop a national conservation strategy to improve the status of the remaining wolf populations. Workshop participants identified five major issues affecting the conservation of the Ethiopian wolf: population management; community conservation; habitat management; public awareness; and policy change.

Habitat loss and fragmentation and the transmission of disease, mainly rabies, from domestic dogs were identified as the most severe risks to Ethiopian wolf populations. Other risks included human persecution (e.g., traffic accidents, "revenge" killings after livestock depredation), problems associated with dogs (e.g., hybridization, competition), inbreeding, and risks associated with conservation infrastructure failure. Recommended actions to address these risks included monitoring wolf populations as well as human impacts, demographics and threats to all populations; assessing which wolf populations are most at risk; assessing the feasibility of rabies vaccination regimes; and monitoring the genetic status of populations.

Six risk indicators were identified to assess the relative risk to each population: population size; severity of disease in local dogs; degree of human–wolf contact; habitat vulnerability; human attitudes; and the proportional amount of edge habitat. A comparison of these risk factors indicated that the populations in North and South Wollo were at greatest risk, and those in Arsi and Bale at lowest risk.

In return for certain benefits, it was believed that the Ethiopian wolf and its habitat could be conserved, despite the compromises that this would entail. This could be carried out through the creation of a community-based structure, the responsibilities of which would include: examining existing community-based natural resource management systems that could form the basis for protecting the wolf and its habitat; maintaining good security in the region; ensuring sustainable use of natural resources; ensuring that the community benefits from wolf and habitat conservation; and ensuring that these benefits are shared fairly.

The highest priority issue related to habitat protection and management centered on the settlement of people in protected areas and the resulting reduction of habitat. Goals developed to reduce this pressure included strengthening agricultural deliveries to areas around protected areas; initiating tree planting in homesteads/woodlots; developing land-use plans/policies to prevent further agricultural expansion into protected areas; promoting family planning; conducting censuses; and monitoring the human population in wolf areas. Another concern is the lack of well-marked boundaries and a lack of respect of boundaries by local people. Participants suggested delineating mutually agreed upon boundaries, erecting signs at strategic points, developing good maps and promoting revenue-sharing mechanisms to encourage people to respect protected area boundaries.

Problems identified related to public awareness including a lack of public awareness about Ethiopian wolves, lack of attention by government and NGOs, poor communication between wolf conservationists and the general public, and no evaluation of wolf conservation efforts. Recommendations included: increasing awareness among the general public; including conservation education programs in the national education curriculum; increasing public awareness through conservation organizations; and evaluation of the latter on an ongoing basis.

A lack of conservation policies and enforcement is also a cause for concern. At present, the national conservation and environmental strategies for Ethiopia are quite broad. Although conservation strategies have been decentralized to 11 regions within Ethiopia, only a few regions have developed specific strategies. Participants suggested creating a centralized policy for

wildlife management and conservation, especially for endemics and national parks; setting specific sector policies for wildlife, especially endangered species; and building conservation and management capacity at federal and regional levels. Other recommendations included enforcing existing laws, developing new laws that will effectively protect Ethiopian wildlife, and developing an environmental legislation framework.

Other identified problems centered on excessive encroachment into wildlife habitat for agricultural purposes and a lack of sufficient protected areas for the Ethiopian wolf. Current park management systems exclude the local community. Participants agreed that in general, government officials underrate the importance of sector issues associated with wildlife, forests, land-use and fisheries, putting inordinate attention on agricultural production at the cost of wildlife.

Submitted by Susie Ellis, CBSG; David Wildt, CBSG; and Claudio Sillero-Zubiri, Ethiopian Wolf Conservation Programme.

Thamin PHVA

Yangon, Myanmar, January 2000

The Myanmar population of thamin (*Cervus eldi thamin*), or Eld's deer, was estimated at 4,000 animals in the 1970s. By 1992, only 2,200 deer remained within the country in 20 fragmented populations, with the largest population in the Chatthin Wildlife Sanctuary (CWS). Sight surveys conducted at CWS by the Myanmar Department of Wildlife Conservation (MDWC) indicated a 40% decline in thamin abundance since 1983. Landscape analyses indicate that thamin only survive in habitat patches large enough to escape the impact of villages. No populations of thamin are known in forest areas less than 100 km^2 in size.

Disturbance and interaction with humans seem to be the most important force contributing to the decline of thamin populations. The largest reservoir of thamin resides in CWS; however, there are about 19 villages surrounding the sanctuary and three villages within the sanctuary boundaries. Villages within CWS use sanctuary land for agriculture and cattle grazing; there also is a great deal of fuel wood consumption, which leads to habitat degradation.

To address these concerns, a PHVA workshop was held at the Center for Forestry Training at Hmaw Bi, Myanmar from 24-27 January 2000 in concert with the Myanmar Ministry of Forestry and the Conservation and Research Center, Smithsonian Institution (US). Forty people attended the workshop, including Myanmar biologists, researchers, park wardens, and wildlife managers. The primary aim was to develop a first-cut conservation action plan to improve the status of thamin in Myanmar, particularly within CWS. PHVA participants identified five main issues affecting the conservation of the thamin, which were then examined more closely in five smaller working groups: population biology/modeling; threats; buffer zone creation; infrastructure; and public and policy makers' awareness.

Population models showed the critical need for <u>immediate</u> action if the decline in the thamin population is to be slowed. These models suggested that the probability of extinction of the thamin population does not decline to a tolerable level (below 10%) until virtually <u>all</u> human-related threats have been removed. The most severe threats to the thamin population relate to the presence and use of CWS by humans and their livestock and domestic animals. The most substantial threat-reducing action would be to remove this presence or reduce the direct impact of the villagers on the core area of the sanctuary, including removal of cattle from and exclusion of human activities in the reserve.

If the villages in and surrounding CWS are permitted to continue to grow, then agriculture, deforestation, poaching and cattle grazing will destroy the small amount of remaining thamin habitat. The suggestion to relocate the three villages currently within CWS (as proposed by the chief commander of the Northwest Command in 1996) led to a great deal of animated discussion in plenary. A separate working group was convened to briefly discuss this issue.

Two possible scenarios were considered: moving the villages, or making changes if the villages remain in the sanctuary. Briefly, if the villages were moved, it will be important to involve local government, NGOs and villagers in discussions about relocation before decisions are made. Considerations for the new location included the construction of new homes according to villagers' wishes, substantial financial and land compensation, and training in agricultural techniques.

If the villages were allowed to remain in the sanctuary, solutions/considerations include introducing family planning and adequate health care facilities, exploring options for removal of cattle from inside CWS, considering a moratorium on new development, and disallowing homes to be protected areas to be passed on to offspring. Participants strongly urged MDWC to consider developing a management plan, in collaboration with village representatives, to control village activities to sustainable levels within prescribed zones as well as developing an education program for villagers of all ages, with special conservation components for children. A system of rewards was suggested for people assisting in anti-poaching activities. Another important solution would be to explore idea of alternative fuels, re-forestation projects or planting fuel wood plantations for villagers' use.

Possible steps for a sequential implementation plan also were developed, beginning with providing villagers with the option of either being resettled or developing and implementing a management plan to enable them to remain living within the sanctuary.

Extraction of resources, notably fuel wood, grazing, drinking water for humans and livestock, poaching and minor forest products are severe threats. Currently, there is no plan for the controlled, sustainable extraction of such resources. Participants recommended that community-based management plans for sustainable use of natural resources within buffer zones be implemented as soon as possible.

Within MDWC, participants lamented that staff lack qualities desired to do the best job possible. The Ministry currently has few resources and a limited budget. Salaries of all Ministry staff do not meet living requirements. Participants recommended re-instituting a rice allowance to park staff, and that all park staff stationed at remote sites receive an additional stipend to compensate for the lack of other incomes for their families. Additionally, it was recommended that the MDWC consider establishing an exam-based merit system to demonstrate the knowledge and ability of the staff, and that could result in cash and badge rewards for staff reaching pre-set levels of expertise. There are limited opportunities for technical training in wildlife-related topics in Myanmar and no long-term plan for human resource development. At present, the greatest training need is for basic training in wildlife biology. Participants recommended establishing eligibility criteria for park staff that includes both park experience and basic training in ecology and park management as well as wildlife curriculums, with a field component, at Yangon and Mandalay Universities.

Another problem is the strong economic pressure on natural resources. Economic hardship, reinforced by the absence of conservation awareness and proper land use policy, is driving the government as well as local people to convert wildlife habitats to agricultural land. Participants recommended creating income-generating activities for villages (e.g., tourism, livestock breeding), inviting policy-makers to workshops and reserves, and demonstrating the continual benefits of sustainable management through research.

To address the general lack of environmental conservation awareness among the public in Myanmar, participants recommended as a high priority to use the CWS Environmental Educational Center (EEC) as a community center to discuss conservation issues. This could facilitate CWS's use as a model for education, as well as the development of new methods of management and new projects that would benefit the forest, the thamin and local people.

This workshop represented a first step in defining key issues affecting the long-term survival of thamin in Myanmar. The workshop recommendations represent a range of the many options available for management of this species. Other components of a comprehensive management strategy may still need to be examined. Participants in the workshop attempted to provide preliminary, yet concrete, suggestions for immediate steps that can be taken to ameliorate human pressures on thamin habitat, while also making suggestions to help meet local community needs within the area surrounding the primary thamin habitat, the CWS.

The situation facing the thamin is critical. Stopping its population decline will not be a matter of applying one solution, but rather a combination of solutions. If the thamin is to survive long-term, difficult choices soon must be made by the government of Myanmar and its people. The ultimate fate of the thamin is in their hands.

Submitted by Susie Ellis (CBSG), Chris Wemmer, Steve Monfort, Bill McShea (Conservation & Research Center, Smithsonian Institution) and Jon Ballou (National Zoological Park).

Algonquin Wolf PHVA

Minden, Canada, February 2000

Throughout the 1990s, there has been a considerable increase in public concern for the survival of the wolves of Algonquin Provincial Park (APP). Much of this concern stems from the results of radio-tracking and ecological studies, which revealed that many of the collared wolves from the eastern part of the park moved outside of the park in winter to feed in surrounding deer yards. Some of these collared wolves were killed in these areas through hunting, trapping and persecution.

In the summer of 1998, the Minister of Natural Resources established the Algonquin Wolf Advisory Group (AWAG) to provide recommendations for an Adaptive Management Plan to ensure the long-term conservation of wolves of Algonquin Provincial Park and surrounding areas. The AWAG includes representatives from local communities, government, trappers, hunters, environmental conservation organizations and the science community.

To help the AWAG assess the status and management of wolves in APP, the Ontario Ministry of Natural Resources, World Wildlife Fund (Canada) and the Canadian Wildlife Service of Environment Canada sponsored a PHVA workshop held from 15-18 February 2000 just outside Algonquin Provincial Park. A diverse group of over 60 people participated in the workshop, including biologists and researchers from universities and government agencies as well as stakeholders from local communities, Algonquin First Nations, private conservation organizations, hunting, trapping, outfitting and agricultural interests.

The major issues affecting the conservation of wolves in Algonquin Park were identified by workshop participants and became the focus for the subsequent working groups: Taxonomic Status, Population Dynamics and Modeling, Prey Habitat, Landscape Ecology and Human Values. Each working group was asked to identify and amplify the most important issues within their topic area and to recommend strategies and actions to address these issues. Each group reported to all participants in plenary sessions so that issues were carefully reviewed and discussed by all workshop participants. The majority of the workshop recommendations were accepted by consensus.

Taxonomic Status

The wolf that occupies central Ontario, including APP, was identified as being morphologically distinct as early as 1970. Genetic work now in progress confirms this distinctiveness and suggests that these smaller, uniformly colored animals should not be considered as a subspecies of the gray wolf (*Canis lupus lycaon*) but rather, along with the red wolf of the southeastern U.S., be classified as a separate species of eastern Canadian wolf more closely related to the coyote. The working group recognized the distinctiveness of the wolves of Central Ontario without implying acceptance or rejection of this proposed new taxonomic classification.

Genetic evidence suggests that there is significant gene flow between wolves in Algonquin Park and wolf populations in northwestern Ontario, northeastern Ontario and southern Ontario. The same wolf taxon may extend to southern Manitoba, Minnesota and southern Québec as far as the Laurentides Game Preserve. Despite some introgression of coyote genetic material, at present there appear to be very low levels of gene flow between wolves in Algonquin Park and coyote-like animals outside of the park to the south.

The working group recommended that a meeting of wolf taxonomists and geneticists be convened to discuss and resolve the classification of North American wolves. To gather sufficient data to address these taxonomic issues, it was recommended to obtain and analyze genetic and morphological samples from wolves in southwestern Québec, northeastern Ontario, the western region of Algonquin Park, and areas adjacent to the west and southwestern boundaries of the park. A genetic monitoring program should be designed and implemented to assess changes in coyote introgression into the eastern Canadian wolf populations, including the APP population.

Population Dynamics and Modeling

The use of an Adaptive Management (AM) model was in the Terms of Reference of the Algonquin Wolf Advisory Committee. In the context of the AM directive, the working group recommended the use of AM to determine whether reduction of human-induced mortality through changing levels of hunting and trapping outside of APP will affect the population of wolves in the park.

Additional recommendations including a re-analysis of selected population demographic data to determine the potentially confounding effect of variable population size on temporal trends in population density. Additional data on pack-specific characteristics is needed in order to construct more realistic models of wolf population dynamics that rely on a pack-based spatial structure. Confident estimates of pup production and mortality would also be very valuable as a means of estimating population recruitment rates.

Demographic and habitat data for wolves in the western portion of Algonquin Park is necessary to develop a complete picture of the growth dynamics of the wolves within the entire park. Long-term field studies to evaluate the population dynamics of wolves bordering the park are needed in order to develop a metapopulation model that is not restricted to modeling the APP wolf population as a closed system.

Prey Habitat

There appears to be no current need for habitat modification for the purpose of increasing prey populations for the wolf in Algonquin Park. The working group did outline a strategy to be considered if habitat manipulation habitat is deemed necessary in the future. Top priority was given to the development of a Wildlife Management Plan for the Park as part of the Algonquin Provincial Park Management Plan which includes plans for monitoring, research, habitat and fire.

Landscape Ecology

A regional focus beyond the boundaries of Algonquin Provincial Park and consideration of ecological connectivity to adjacent areas is necessary to address the wolf issue. The scientific evidence regarding taxonomy of the wolf found in APP is unclear making it difficult to make management decisions for park wolves in isolation.

Wolf population persistence does not appear to be undermined by the hunting activities undertaken within APP. Human-induced mortality of wolves migrating from their territories in transboundary deer-foraging excursions may be a limiting factor to the viability of the wolf population on the east side of APP. The demonstrated traditional migratory dynamics of packs from eastern Algonquin Park show that the hunting ban in the three townships adjoining the Round Lake deer yard must be maintained to protect migrant wolves. If the migrant wolf population using the yard recovers to a sustainably exploitable level the ban could be lifted.

Working group recommendations included promoting connectivity among wolf populations, minimizing human disturbance and the impact of roads on wolves, modifying forest management strategies to promote prey and wolf populations, ensuring compliance with provincial trapping standards, monitoring human-wolf interactions, and promoting continued academic research within the park. Several recommendations were also made regarding the regulation of harvest of wolves in areas adjacent to the park.

Human Values

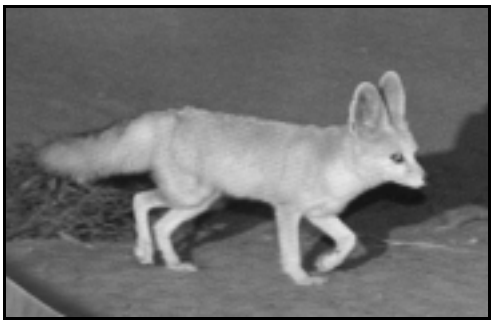
The social /human equation and its subsequent values are crucial and determining elements in the issue of survival of wolves in and around APP. To achieve buy-in for long-term survival of wolves in and around the park, there is a need to send a consistent message to the public and politicians. This includes agreement on the analysis and conclusions of the scientific data available for park wolves. More information is needed regarding the actual level of human-caused mortality in wolves, either intentional or incidental.

The establishment of a group to discuss and analyze the issue of trapping in the Park. This group would include stakeholder involvement and public consultation. Since 1994 there has been an informal "zero harvest agreement" with the Algonquin First Nations on wolves in Algonquin Park. These current informal agreements to not take wolves inside the Park should be formalized and enforced.

Modification of harvesting regulations were also made by this working group. The establishment of a wolf management zone around APP (that could contain a number of different options to manage wolves) to limit the numbers of wolves taken by hunting and trapping was discussed. The group recognized the need to consult with trappers to discuss wolf-related matters of concern to them. For example, if a ban on trapping wolves is implemented, then consideration should be given to compensating trappers for loss of fur production. Compensation within the wolf management zone should be adequate for all livestock loss as a result of wolf protection.

Arabian Carnivore CAMP/ Leopard & Tahr PHVA

Dubai, United Arab Emirates, February 2000



The large carnivores of the Arabian Peninsula region – leopard, wolf and hyena – generally have a poor reputation among local communities and the general public. There is a widespread impression that these species are declining in numbers, with the remaining animals fragmented into small populations. Most of the small carnivores have received little attention and their status is uncertain. The Arabian tahr was of special concern because of its low numbers 25 years ago and the uncertainty about the continued direct impacts of local human populations on the population and its habitat. Although there are active research groups in each country, there has not been a pooling and synthesis of the new information that has been accumulated in recent years to provide a systematic assessment of the status of the species. Increasing concern about the impact of human populations and shifts in the distribution of some species as well as an increased interest in collaboration between conservation groups in the region provided the motivation to convene a regional workshop to address some of these issues. This workshop was intended to allow researchers and wildlife managers from throughout the region to combine their information and field experience in order to provide an overall regional as well as a country-by-country review of the status of these species. The Arabian leopard and the Arabian tahr were selected for more intensive assessment because of concerns that they are in most urgent need of effective management and conservation action.

An Arabian Carnivores CAMP, Arabian Leopard PHVA and Arabian Tahr PHVA were held on 5-11 February 2000 at the Breeding Centre for Endangered Wildlife in Sharjah. The combined workshop included participants from the Kingdom of Saudi Arabia, Republic of Yemen, Sultanate of Oman, Bahrain, United Arab Emirates (Abu Dhabi, Sharjah, Dubai), Germany, Switzerland, United Kingdom and the United States.

Arabian Carnivore CAMP

The CAMP review provided evaluations of 19 species (18 carnivores plus the Arabian tahr) as follows: extinct (2), critically endangered (2), endangered (0), vulnerable (7), near threatened (1), low risk (5), data deficient (1), not evaluated/outside of geographic range (1). The leopard was listed as critically endangered and the tahr as vulnerable – an improvement in status for the tahr.

Participants recognized the lack of knowledge regarding the current status of many Arabian carnivores and recommended monitoring and survey work in all countries in the Arabian Peninsula, particularly current and planned protected areas. Yemen was identified as an important area for research; to overcome the lack of resources in this country, regional cooperation is recommended to assist Yemen in conducting needed surveys. Current survey work in Saudi Arabia should be expanded into the northwestern mountains, which include low human populations and relatively intact habitats. Regular exchange of personnel and information on status, distribution and survey techniques is needed among organizations within the entire region to avoid duplication of effort and to standardize data collection.

General environmental awareness needs to be improved, with particular attention to native carnivores, their ecological role, and a realistic appraisal of the threat they pose. Proposed work in local communities included reducing human/animal conflicts, such as through a pilot program for compensation for leopard and possibly caracal depredation. Education in environmentally friendly activities may reduce habitat loss due to grazing by domestic livestock.

Captive breeding was recognized as a necessary and useful tool for several of the more endangered felids such as the leopard, cheetah, caracal, wild cat and sand cat. Captive breeding also plays an essential role in public awareness through education programs in zoos and wildlife centers.

Arabian Leopard PHVA

This proved to be a stimulating and very intensive review and analysis of the distribution, numbers, and status of the leopard throughout the region. This subspecies is stated to be critically endangered in the region. One of the populations may be of a different subspecies, an issue that needs to be resolved.

Projection of outcome for various scenarios for the Arabian leopard clearly indicated that this species is at high risk for extinction but that this outcome could be drastically altered with specific changes in population management and protection. Specific recommendations for the leopard focused on regional cooperation and collaboration including survey and protection actions, particularly in Yemen, with cooperation from multiple regional organizations and regionally organized international cooperation in a captive management program. Range countries are encouraged to enforce national and international legislation relating to the illegal capture, trade and killing of leopards.

Arabian Tahr PHVA

Populations of the Arabian tahr (*Hemitragus jayakari*) have show resilience in a difficult environment based upon recent field data and population model simulations. Field estimates suggest that the total population has risen from 2,000 in 1978 to about 6,400 in 1998. This increase may be due to two factors, a relief form hunting in key areas and a reduction in grazing pressure. Vortex simulations show that tahrs are resilient in the face of droughts occurring every four years, which significantly increase mortality and reduce breeding success. However, the occurrence of additional negative factors such as disease and hunting adversely affect the population and cause population trends to be less predictable. A better understanding of tahr migration is important. Widespread migration would have important implications for disease spread and inbreeding and will determine whether tahr should

be managed as a single population or a number of isolated subpopulations.

The main recommendations of the PHVA were to reduce factors that increase tahr mortality (specifically, disease transmission from domestic stock and illegal capture, hunting and trade), to improve understanding of species biology (especially with regard to migration), and to establish an informal group to address matters related to the exchange of captive animals to reduce illegal and incompetent take from the wild.

Table 1. Conservation status assigned to species during the CAMP process.

Species	Status	Species	Status
Arabian wolf	Vulnerable	Bushy-tailed mongoose	Critically Endangered
Asiatic jackal	Vulnerable	White-tailed mongoose	Lower Risk (least concern)
Rueppell's sand fox	Vulnerable (in UAE)	Indian grey mongoose	Lower Risk (least concern)
Blanford's fox	Vulnerable	Marbled polecat	Not Evaluated
Red fox	Lower Risk (least concern)	Arabian leopard	Critically Endangered
Fennec fox	Extinct in the Wild	Cheetah	Extinct
Striped hyena	Vulnerable	Caracal lynx	Lower Risk (near threatened)
Honey badger	Data Deficient	Sand cat	Lower Risk (least concern)
Genet	Vulnerable	Arabian wild cat	Lower Risk (least concern)
Arabian tahr	Vulnerable		

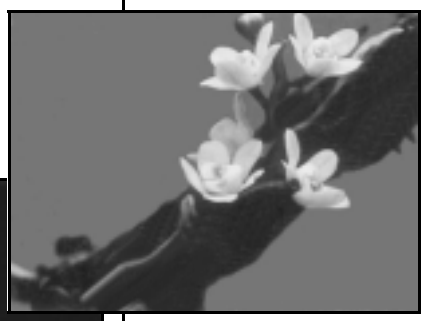
Western Ghats Orchid CAMP

Coimbatore, India, May 2000

From 15 - 19 May 2000 a Conservation Assessment Management Plan workshop was held in Coimbatore for 375 orchids occurring in the Western Ghats, with special focus on those endemic to the biogeographic zone. This CAMP workshop was organized by CBSG, India and several collaborators (ZOO, WILD, Wildlife Information Liaison Development Society, Institute for Forest Genetics and Tree Breeding, IFGTB) and was sponsored by the Paignton Zoological and Biological Gardens and the IFGTB. Thirty-seven participants from 20 institutions from southern India attended the five-day workshop and formed working groups for assessing endemic species.

A new six-page Taxon Data Sheet was introduced which incorporated new sections on uncertainty and data quality. Other innovations included the use of volunteer researchers as recorders and researchers at the workshop. A three-day training module had been organized before to familiarize the researchers with the modus operandi of CAMP process. This workshop was suggested three years ago by Dr. Anantha Rao of the Karnataka Association for the Advancement of Science who also started a Special Interest Group on Orchids.

The ISOSG (Indian Subcontinent Orchid Specialist Group) sent a representative, Dr. Satish Kumar from the Tropical Botanical Gardens Research Institute, who spent a day before the workshop assisting with the list of plants. Dr. Kumar will be first editor of the CAMP Report, and it is hoped that the output will be a collaborative product of the ISOSG as well as the other collaborators.



Orchid species were assigned to the following categories of threat as follows:

Critically endangered	20
Endangered	45
Vulnerable	14
Lower Risk - near thr.	10
Lower Risk - least concern	1
Lower Risk - cons. dep.	0
Data Deficient	11
Extinct	4
Total	104

Workshop participants also made the following recommendations:

- Botanic institutions and individuals in South Asia should be notified of Data Deficient (DD) species of orchids so that they might prioritize those species for field work and research studies.
- A complete list of Western Ghats orchid field researchers should be compiled so that researchers unable to attend this workshop might be polled for information on DD species.
- A list of threatened species and a copy of the CAMP report should be provided to the Ministry of Environment and Forests as well as to the southern India policy makers and agencies with responsibility for protecting threatened species.
- Attempts should be made for the preparation of biological flora of orchids of the Western Ghats covering: Niche, habitat, octension, population, phenology, pollination, pollinators, tissue culture, commercial value and other relevant issues.
- Studies related to disease, anatomy, embryology, microbiology, pollution, origin of epiphytism and habitat improvement should be undertaken.
- Facilities should be generated for germ plasm collection, genome resource banking, orchidara and national/regional site for literature.
- Such studies should be encouraged in the form of sponsored programs to orchid specialists and scientists of universities and research institutions.
- *In situ* and *ex situ* conservation programs should be linked near hot spot areas, which would assist in acquiring samples for tissue culture to propagate more species and create public awareness.

Submitted by Sally Walker, CBSG, India.

Sumatran Elephant Workshop

Cisarua, West Java, Indonesia, April 2000

Based on the Sumatran Elephant PHVA Workshop in 1993 and concerned by the escalation of conflict between humans and elephants in Sumatra, the CBSG Indonesia Program and Taman Safari Indonesia (TSI)/Indonesian Zoological Parks Association, in association with the Directorate General of Protection and Nature Conservation (PKA) and *The Jakarta Post*, held a workshop on the Sumatran elephant at TSI, Cisarua, Indonesia on 24-25 April 2000. This workshop was sponsored by many national and international organizations, including the Forum for Indonesian Wildlife Conservation, Indonesian Wildlife Fund (IWF), Flora and Fauna International, several U.S. and Australasian zoos (Adelaide, Melbourne, Taronga, Monarto, Auckland and Columbus), CBSG Japan and Asian Wildlife Conservation in Japan.

The workshop was preceded by an elephant walk at the Jakarta Stadium that highlighted the plight of the Sumatran elephant, both in the wild and captivity. The Director General of PKA, Ir. Harsono, spoke to almost 5,000 people of the serious nature of human-elephant conflict in Sumatra and urged the public to support both *in situ* and *ex situ* conservation efforts. Ir. Widodo Ramono, Director of Protected Area Conservation, then underlined the need to maintain adequate habitat for all wildlife. Representatives from Columbus, Adelaide and Taronga Zoos spoke to the need to integrate *ex situ* and *in situ* conservation programs.

Opening the workshop, Dr. Ir. Nurmahmudi Ismail, the Hon. Minister of Forestry, stressed the need to manage elephant populations both in the wild and captivity with minimum conflict with people. Each year more Indonesians are relocated from overcrowded Java to the outer islands such as Sumatra, leading to greater conflict with wildlife. He stressed the importance of mitigating the escalating human-elephant conflict in Sumatra and the wise use of those elephants captured and removed from conflict situations. Today, many farmers view the elephant as a serious pest and a liability rather than an asset. A radical change is needed in the perception of the elephant and its possible role in the economy of the people. Trained elephants are an asset: they can be used in forestry, agriculture and ecotourism. Utilization on a sustainable basis may be the only means by which elephants and other wildlife will have a long-term future in Indonesia and elsewhere in overcrowded Asia.

Over 100 participants from Indonesia (from national parks, elephant training centers, local government, zoos, and NGOs) as well as eight foreign countries attended the two-day workshop. Participants divided into working groups to discuss various issues concerning the management and conservation of elephants in Indonesia. Several options to mitigate human-elephant conflict were discussed. Another issue was the maintenance of viable elephant populations, including habitat patches of adequate size. No protected area is currently large enough to accommodate the annual home ranges of elephant herds, emphasizing the need to prevent further indiscriminate forest loss and fragmentation. Today a large part of the elephant's range lies outside protected areas.

During the workshop Prof. Ir. Rubini Atmawidjaja, IWF Chairman, stressed the need to find a long-term solution to the elephant problem in Sumatra and encouraged the participants to propose land-use strategies that are likely to minimize conflict. He also reminded the participants of the legitimate aspirations of the poor rural people for a better lifestyle, In areas where people and elephants overlap, the people who suffer the brunt of the elephant depredations should derive some benefit from the presence of the animals.

One of the workshop outcomes was the establishment of a Trust Fund for the Management and Conservation of the Sumatran Elephant. Many international zoos have pledged support to this fund, integrating *ex situ* and *in situ* conservation efforts. This is the first step toward reconciling the needs of elephants with the needs and interests of the local people.

Submitted by Jansen Manansang, CBSG Indonesia.

CBSG Giant Panda Activities in China

Peoples Republic of China, October 1999 to March 2000

Conservation Assessment and Research Techniques Workshop

In October 1999, at the invitation of the State Forestry Administration (SFA), CBSG conducted a Conservation Assessment and Research Techniques (CART) workshop at the China Research and Conservation Center for the Giant Panda in Wolong, China. Supported by the AZA Giant Panda Group, Zoological Society of San Diego, Ocean Park – Hong Kong, National Zoological Park and Memphis Zoo, the workshop was attended by representatives from the Chinese Association of Zoological Gardens of the Ministry of Construction (MoC), various universities and non-governmental organizations such as WWF-China. A key accomplishment was the bringing together of the two agencies (SFA and MoC) for discussions on the wild and captive populations.

The workshop was undertaken to meet four main objectives. These were to:

1. Bring together Chinese biologists, reserve managers and other stakeholders to identify the primary issues affecting giant panda conservation, and to formulate priorities for practical measures to assist in their resolution.
2. Discuss various survey and census methodologies that might have application to the national survey scheduled to begin in October 1999.
3. Identify and initiate useful technology transfer and training.
4. Assess the current status of the captive program and assist in the formulation of future directions to contribute to overall conservation.

Additionally, a risk analysis and population simulation model for the giant panda was developed, which with further amplification could be used to guide and evaluate management and research activities.

Participants identified issues that formed the basis of six topic-based working groups: monitoring and survey methodologies; wild population dynamics and genetics; captive population dynamics (studbook issues); captive population management (husbandry and behavior); future role of the captive population; and infrastructure needs and support. The major workshop accomplishments are summarized below.

For the wild population:

- Methodology suggestions to improve the Chinese National Survey, including improvements to field check sheets; collection of fecal samples for genetic assessment; and assessment of human impact.
- Recommendations for training workshops on:
  - Role, value and practicality of radiotelemetry.
  - Remote sensing/GIS for habitat monitoring.
  - Non-invasive DNA/hormonal techniques.
- Recommendation to effectively mobilize resources for reserve support and to develop methods to generate income internally. Build income-generating activities in communities in and around giant panda reserves.
- Request to organize effective capacity building through training programs and study tours, including improving management knowledge and skills for reserve managers.
- Development of greater public awareness of laws and regulations.
- Strengthen reserve patrolling and law enforcement.

For the captive population:

- The captive population should be considered as one entire population, first in China and then worldwide.
- Recommendations were made to increase cooperation between zoos and reserves by:
  - Maximizing breeding potential and genetic viability by exchanging animals and semen.
  - Alternating organization of the annual Giant Panda Technical Committee meeting between SFA and CAZG.

  - Promoting participation of staff from both SFA and CAZG in training programs, workshops, and meetings to promote cooperation between *in situ* and *ex situ* programs.

- All animals from SFA and CAZG were entered in the Giant Panda Studbook, which was newly published in December 1999.
- Strong recommendations were made to:
  - Manage kinship so that genetic diversity is maximized over the next generations.
  - Recruit more males into the breeding population.
  - Clarify paternity of questionable animals.
- More funds need to be raised to support captive giant panda programs.
- There is a need to understand nutritional needs at all life stages.
- Preventative medicine programs should be established.
- Facility and behavioral requirements must be addressed.
- Staff training needs need to be assessed and training programs need to be developed.

Veterinary Training and Nutrition Workshop for Carnivores

In December 1999, CBSG returned to China with a multidisciplinary team including veterinarians, pathologists, nutritionists and reproductive specialists to conduct a training course on Veterinary Medicine and Nutrition with support from the Columbus Zoo.

Hosted by the Chengdu Zoo and Chengdu Research Base of Giant Panda Breeding, this workshop provided hands-on training in veterinary diagnostics, anesthesia, pathology and nutrition to 49 veterinarians from 27 Chinese institutions. Trainers included 17 staff from the Zoological Society of San Diego, Columbus Zoo, National Zoological Park, Saint Louis Zoo, Zoo Atlanta, Memphis Zoo and CBSG, as well as Chinese veterinarians who had previously participated in the first and second Giant Panda Biomedical Surveys. A training manual was prepared and translated into Chinese. In addition to lectures, hands-on laboratory sessions were conducted on anesthesia and pathology.

At the end of the five-day workshop, trainees were asked to identify topics requiring attention in future training workshops. Several topics emerged as needing additional training workshops: ultrasound; nutrition and husbandry (including hand-rearing, preventative medicine and applied dietary information); pathology/immunization; reproduction; and veterinary medicine techniques for other wildlife species. CBSG is attempting to raise funds to conduct several of these workshops within the next 2-3 years.

Giant Panda Biomedical Survey – Phase III

In February and March 2000, a CBSG team with members from the Zoological Society of San Diego, the National Zoo and its Conservation and Research Center, and the Saint Louis Zoo extended the Biomedical Survey (Phase III) to include an additional 18 giant pandas at the Wolong Breeding Center. Four other females examined in 1999 were re-evaluated in 2000. This extensive, integrated information from the disciplines of veterinary medicine, reproductive biology, behavior, nutrition, genetics and pathology provides an invaluable database that facilitates additional steps for developing a self-sustaining, healthy population of giant pandas. All data for each giant panda (anesthesia, medical, reproduction, behavior, etc.) were recorded in a master database. Succinct summations for each animal were prepared for the purpose of classifying individuals as a Prime Breeder, Potential Breeder, Questionable Breeding Prospect or Poor Breeding Prospect. All data were discussed between the CBSG and Wolong teams in a technical meeting following the completion of all evaluations. Following consensus on findings and interpretation, all data, including management recommendations, were provided to all participants.

Anesthesia was induced in all giant pandas surveyed. Once tractable, each animal was tattooed and a transponder chip (Trovan) was inserted to ensure unambiguous identification. Skin, hair and heparinized blood samples were collected for genetic analysis. A general physical examination was performed, and blood was collected for hematology and serum chemistry analysis. Testes of males were measured and palpated for tone and consistency, and for females

a vaginal smear for cytology was prepared. An ultrasound examination of the abdomen was conducted for each animal. Three females were examined laparoscopically to examine the reproductive tract.

Electroejaculation was performed on selected male pandas, and the resulting sperm samples were evaluated and cryopreserved. Aliquots from each sample were thawed and evaluated by the CBSG and Chinese teams together, both to determine optimal methods of freezing and thawing giant panda sperm and to assess the ability of sperm from various males to survive cryopreservation. All cryopreserved sperm samples were stored on-site at the respective collection locations.

Aspects of nutrition and dietary husbandry were collected, which included: identification and quantification of all food items offered; food offered and intake data; seasonal variations in diet; information on food storage and preparation facilities; feeding frequency of various diet components; distribution of food within enclosures; and sites of food presentation. As part of the medical examination, body weight, anatomical measurements and body condition were characterized. Typical fecal output within a 24-hour period, occurrence of mucous stool and the association of blood with the mucous stool were determined from daily logs. All diets were evaluated using Zoo Diet Analysis Program software.

Historical and behavioral data were collected, including origin, date of birth and reproductive history, past opportunities to breed and reproductive success. Information also included evaluation by keepers of various behavioral characteristics for each animal, such as calmness, shyness or aggressiveness. Pedigrees were constructed on the basis of studbook analysis and information provided by local staff.

Cumulative results of the three years of the Giant Panda Biomedical Survey, conducted at the Chengdu Zoo and the Chengdu Giant Panda Research Center, Beijing Zoo, Chongqing Zoo and China Research and Conservation Center for the Giant Panda (Wolong) are shown in the table below. Approximately 38% of the animals evaluated were classified as Prime Breeders, 39% as Potential Breeders, 11% as Questionable Breeders, and 8% as Poor Breeding Prospects.

At the time of this article, the 2000 birthing season had begun in Wolong and six cubs had been born. Two of these births are of special note for the CBSG team: a 10-year-old, wild-born female produced her first cub. This female had consistently failed to reproduce and was examined laparoscopically by the CBSG-Chinese team earlier this year. As a result of intensive findings and further combined discussions, a new breeding plan was designed for this female. With additional assistance of urinary hormone monitoring (Laura McGeehan, Zoological Society of San Diego), it is notable that this founder giant panda has recently given birth to a healthy cub. A second, important birth was produced from frozen semen of an unrepresented, wild-born male with a cancerous lesion on his dorsum. This male has subsequently died, but these combined efforts have ensured that he has reproduced.

Submitted by Susie Ellis (CBSG), David Wildt (National Zoo), Don Janssen and Mabel Lam (Zoological Society of San Diego).

Table 1. Classification of breeding status of 61 captive giant pandas.

Institution	Total # animals	Prime breeders	Potential breeders	Questionable breeders	Poor breeding prospect	Not classified
Chengdu Zoo & Base	6.14	2.5	3.6	0.1	1.2	0.0
Beijing Zoo	4.5	1.2	0.2	1.0	0.1	2.0
Chongqing Zoo	0.3	0.2	0.0	0.1	0.0	0.0
Wolong Center	14.15	6.5	7.6	1.3	0.1	0.0
Total 61 animals	24.37	9.14	10.14	2.5	1.4	2.0

Disease Risk Assessment Workshop

Omaha, NE, USA, March 2000

The risk of disease transmission poses considerable problems for conservation professionals involved in the coordinated movements of animals within and/or between wild and captive environments. The common philosophy of accepting nothing more than zero risk has posed an unattainable goal for needed animal movement actions in wildlife conservation programs. Many professionals recognize the need for a comprehensive, unified and broadly applicable set of tools to quantify disease-based elements of risk, and to provide valuable assistance to the decision-making process.

Toward this end, an international group of about 30 people (including zoo and wildlife veterinarians, veterinary pathologists, epidemiologists, and population biologists) gathered for a three-day workshop to develop and test a tool kit meant to assist the qualitative and quantitative assessment of disease risk as a part of the decision-making process in moving captive or free-ranging animals. The derivation of this workshop extends back to a May 1991 working group meeting at the National Zoo, which led to a more extensive analysis of the problems in 1992 at a workshop in Oakland, and two very recent working group meetings in 1999 at Cincinnati and South Africa. A key recommendation of the 1992 workshop was to develop a set of quantitative tools to assist the decision-making process.

The first portion of the workshop was devoted to a series of brief presentations on perceptions of the problems and needs. A number of potential tools were presented, including a disease information workbook developed in New Zealand, computer-based and simpler graphical decision tree approaches, and both the current version of the PVA package *VORTEX* as well as plausible future iterations of the software with greater disease-modeling flexibility. Three working groups were then formed with deliberate mixing of the disciplines to foster cross-disciplinary communication, thereby catalyzing creative analysis of problems and alternative tools. The activities of the working groups evolved from general problem formulation to the analysis of specific examples using some of the proposed tools. A plenary discussion of these results led to each group focusing on one set of tools as well as the development of flow charts documenting the analysis process. As the workshop progressed, three population biologists formed a fourth group devoted to exploring possible approaches to the development of a *VORTEX*-based disease risk assessment module.

The Workbook group focused on the further development of a disease characterization and management document prepared by Richard Jakob-Hoff for the New Zealand Department of Conservation. A revised form was developed with a flow-chart for planning pre-transfer quarantine and health screening protocols.

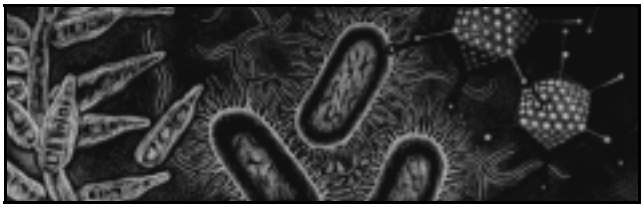
The Decision Tree Tools group prepared a series of examples with quantitative estimates for each step in a formal decision tree. Commercial software tools are available for more complex applications of this approach. A convenient spreadsheet model was also prepared to illustrate the use of this tool for the step-wise calculations. The group noted the need for exhaustive listing of possible diseases of concern and the need for a species-based database of diseases as a reference for such evaluations. A template decision tree was prepared and applied to a series of examples.

The Information Modeling group prepared a flow chart of activities and decisions based on the need to consider both the source and destination populations. They also clarified the terminology to be used to describe the various movement scenarios. In addition, they developed a set of worksheets listing the factors to consider for infectious and non-infectious diseases. This information could feed into the worksheets, the decision trees and the *VORTEX* modeling approaches.

Finally, the Population Modeling group developed a preliminary structure for a *VORTEX* disease module that will incorporate some features from standard epidemiological models and include genetic as well as infectious diseases. Robert Lacy prepared a paper illustrating the application of the current version of *VORTEX* to disease scenarios, particularly through the use of its new ability to model any population rate as flexible mathematical functions. The development of a module for this tool was a high priority among all participants.

The product of this meeting will serve as the starting point for the next link in the workshop chain – a gathering of more than 100 experts preceding the American Association of Zoo Veterinarians in New Orleans, LA in September 2000. Participants will apply the tools developed in Omaha to real life situations from their own experience in order to evaluate and further refine their effectiveness.

Submitted by Phil Miller, CBSG.



Chimpanzee Sanctuary Workshop

Entebbe, Uganda, May 2000

Field reports from across Africa indicate that chimpanzees are under heavy siege due to rapid expansion of local human populations and the resultant increases in hunting and commercial animal trade. One of the major outgrowths of this crisis has been the steady growth of chimpanzee sanctuaries throughout Central and West Africa. From a more humanistic perspective the growth in the number and size of these sanctuaries has had many positive impacts on unnecessary chimp mortality. However, this same rapid proliferation of sanctuaries and their populations has led to considerable confusion about the management goals of chimp sanctuaries at both local and regional levels, the development of consistent management and veterinary standards among facilities, and the structure of fundraising efforts necessary for continued survival of each sanctuary. In addition, the sanctuaries have had difficulties in communicating and coordinating their management activities with other great ape conservation projects within Africa.

In response to the need to address these important issues, a regional planning workshop for chimpanzee sanctuaries in Central Africa was held 1 – 5 May 2000 in Entebbe, Uganda – site of the first chimpanzee PHVA held in 1997. Sanctuaries from 10 African countries (Cameroon, Gambia, Guinea, Kenya, Nigeria, Democratic Republic of Congo, Sierra Leone, South Africa, Tanzania and Uganda) were represented at the meeting. Important issues addressed by the workshop included: the orphanage crisis which is creating problems regarding the size and dynamics of the existing social groups; appropriate size of sanctuaries; animal relocation issues; and effective fundraising initiatives.

Problem Statement

Due to the rapid influx of orphan chimpanzees from increased logging, habitat destruction and commercial development of the bush-meat trade, and lack of awareness in chimpanzee range countries, sanctuaries have emerged on an ad-hoc basis resulting in crisis management. This has made it difficult for long-term planning and adequate collaboration between sanctuaries and chimpanzee experts. There is a very evident need for general guidelines for the establishment of chimpanzee sanctuaries, incorporating liaison with host governments, local communities and authorities, site location, long-term sustainability, management practices, chimpanzee management, and health issues.

The long-term lack of international and national will, combined with an increased pressure on natural resources, has resulted in insufficient protection of chimpanzees and their habitats across equatorial Africa. The bushmeat trade alone accounts for thousands of chimpanzee deaths each year. This has led to a dramatic increase in the number of orphaned and confiscated chimpanzees needing care, which in turn has resulted in a proliferation of sanctuaries. Fifteen sanctuaries now accommodate hundreds of chimpanzees and this problem is growing.

Sanctuaries face a lack of fundraising resources, be they a simple lack of relevant donors or the time and ability needed to develop a fundraising proposal. There are a variety of organic/local fundraising schemes that will particularly emphasize commercial activities (for example tourism, merchandising). An alternative source of funds emphasizes altruistic giving. This money can come from a variety of sources, for example, grant giving bodies, trusts and foundations, corporate business, multi-national institutions, bilateral institutions, and governments. Additionally, gifts in kind can be provided from a number of organizations. Access to altruistic sources, however, almost invariably requires overseas representation.

Recommendations

The importance of developing policies to guide sanctuary operation was recognized. Sanctuaries are encouraged to have an explicit conservation policy. The development of a comprehensive management plan is essential; each sanctuary should have a written policy on the daily care and management of the chimpanzees to ensure their long-term welfare. A chimpan-

zee management manual should be compiled for African-based sanctuaries that takes into consideration the psychological and physical well-being of orphaned chimpanzees. Also recommended is the development of health care protocols that encompass mandatory quarantine procedures, preventative medicine and zoonoses. A veterinary/medical specialist directory should be compiled, incorporating the diagnostic capabilities and facilities available in each region.

Group size in captivity should attempt as much as possible to mimic the situation in the wild; therefore, unnatural group compositions, such as multi-male groups, should be avoided whenever possible. Any observation of abnormal behavior should be reported in written form to the sanctuary manager as soon as possible. Guidelines should be developed for the release of wild-born captive chimps into the wild. These would include site criteria pertaining to future release and/or no release options.

Sanctuaries should keep information on organizational details, animal records, range country data, and activities undertaken by the sanctuary in a standardized format and be accessible to all stakeholders. Participants recommended the compilation of a sanctuary database based on past and present rate of confiscations and carrying capacities to be updated monthly.

Participants also suggested that sanctuaries consider forming an African Chimpanzee Sanctuary Alliance. Individual sanctuaries and a possible future umbrella organization should cooperate with host governments under a Memorandum of Understanding (MOU), with a commitment to enforce local and international wildlife laws. An Emergency Task Force (ETF) should be established to address funding, donations of supplies, expert database and detailed guidelines for all possible emergencies. A written policy and guidelines on communication and public relations was recommended for each sanctuary.

Recent Meetings for Chiroptera Conservation and South Asia Information Network

CCINSA is the South Asian network for bat field biologists and taxonomists, which was initiated following a recommendation by the Chiroptera Working Group at the Indian Mammal CAMP in 1998. Dr. Paul Bates, author of *Bats of the Indian Subcontinent*, will join Indian experts Dr. G. Marimuthu of the Madurai Kamaraj University and Dr. Y.P. Sinha of the Zoological Survey of India as resource persons at the workshop. Thirty field researchers from India will participate in the workshop, which will cover field techniques for studying bats, taxonomy and conservation, including a discussion with wildlife agency officials on how to translate scientific fieldwork output into conservation action. The CCINSA network and the training are sponsored by the Chester Zoo, Upton-on-Chester, UK. CCINSA Network is associated with CBSG, South Asia and Zoo Outreach Organisation but administered by Wildlife Information Liaison Development (WILD) Society.

CBSG, South Asia along with Zoo Outreach Organisation and the Central Zoo, Kathmandu / King Mahendra Trust for Nature Conservation has organized several events in the first part of August 2000. The first meeting of zoo directors of South Asia (Nepal, Pakistan, India, Bhutan, Sri Lanka, Maldives and Bangladesh) has been organized to discuss ways and means of better communication, cooperation and collaboration between the zoos of the region. This is expected to be the first step in the process of forming a regional zoo association.

Following this meeting there will be the inauguration of CBSG, Nepal, a new national CBSG network for the region, and the first meeting of CBSG, South Asia. CBSG tools and processes will be discussed along with how to facilitate conservation action in the region both nationally and internationally.

Finally, there will be a comprehensive South Asia zoo educator training workshop for zoo directors and others associated with zoo education. This is an activity of the Asian Regional Network of International Zoo Educators (ARNIZE). The purpose of the workshop will be to assist South Asian zoos in developing a Master Plan for Education for their zoo.

Submitted by Sally Walker, CBSG, India.

Conservation Planning Workshops

As wild populations of plant and animal species face increasing pressures from human population growth, it is becoming critical for the world's zoos, aquariums and conservation organizations to become more involved in both *in situ* and *ex situ* conservation programs to save these species. In the 21st century, zoos and aquariums will have the responsibility of not only contributing directly to species conservation programs, but also of setting a conservation example for the millions of visitors that pass through their gates each year. CBSG has developed a Conservation Planning process to address this need. The process helps institutions to:

- Define their conservation vision and mission.
- Develop an institutional 'conservation culture'.
- Learn and utilize group decision-making tools.
- Develop partnerships for collaboration on conservation programs and projects.
- Identify common ground among departments.
- Develop a practical zoo-wide conservation plan with measurable objectives and specific actions.

The final product is a Conservation Action Plan that is in line with the institution's core competencies and program focus areas. Ultimately, this results in more effective and integrated conservation initiatives from which all benefit.

Since 1998, CBSG has conducted Conservation Planning workshops for many institutions and organizations including the Minnesota Zoo, St. Louis Zoo, Calgary Zoo, Houston Zoo, Toronto Zoo, Shedd Aquarium, Perth Zoo, Healesville Sanctuary, Biodiversity Conservation Information System (BCIS), International Species Information System (ISIS), Species Survival Commission (SSC) and the World Zoo Organization (WZO).

CBSG has recently taken Conservation Planning one step further with the development of Institutional Facilitation Training. There is growing recognition that facilitated small working group processes are far more efficient than traditional meeting techniques. They assist the development of a shared vision, common ground for problem solving and the development of cross-departmental working arrangements in relation to projects, programs and problem-solving. A fundamental objective of all of the institutions is to develop a 'conservation culture' throughout the institution and facilitation skills are essential for this to happen. Historically, CBSG has taught facilitation skills at the Durrell Wildlife Preservation Trust's International Training Center in conjunction with McGill University for the past seven years. CBSG's first Institutional Facilitation Training Workshop was recently conducted at the Houston Zoo in July 2000.

Submitted by Jenny Shillcox, CBSG.

Past and Future Conservation Planning

Completed Conservation Plans
Zoological Parks of Thailand, Thailand (Masterplan)
Saigon Zoo, Ho-Chi-Minh City, Vietnam (Masterplan)
Rome Zoo, Rome, Italy (Masterplan)
Budapest Zoo, Budapest, Hungary (Masterplan)
Minnesota Zoo, Apple Valley, MN, USA
St. Louis Zoo, St. Louis, MO, USA
Calgary Zoo, Calgary, AB, Canada
Houston Zoo, Houston, TX, USA
Toronto Zoo, Toronto, ON, Canada
Shedd Aquarium, Chicago, IL, USA
Perth Zoo, Perth, Australia
Healesville Sanctuary, Healesville, Australia
BCIS, Washington, DC, USA
ISIS, Apple Valley, MN, USA
SSC, Gland, Switzerland
WZO, Pretoria, South Africa

Future planned workshops
ZooDom, Santa Domingo, Dominican Republic
Seoul Grand Park Zoo, Seoul, Korea
The Living Desert, Palm Desert, CA, USA

The Voyage of the Ark: Are Botanical and Zoological Gardens Having A Positive Impact On Conservation?

By David Galbraith

(Utnapishtim), son of Ubar-Tutu,
Tear down (this) house, build a ship!
Give up possessions, seek thou life.
Despise property and keep the soul alive.
Aboard the ship take thou the seed of all living things[1].

The story of a heroic effort to save life in the face of an unstoppable destructive force has become a powerful metaphor for zoos and botanical gardens, and it's not hard to see why. The biblical flood story is very old, of course, and ingrained in our collective memory. Our society has grown up with the Judeo-Christian version of the flood story (Genesis, chapters 5-9), in which God instructs Noah to construct a large vessel, an ark, to rescue Noah's family and a sample of the earth's biological diversity from the pending deluge of, well, biblical proportions.

Long before the Israelites crafted the familiar form of the Noah story, the same narrative existed in Mesopotamia as part of the Epic of Gilgamesh. Although the names are different (Utnapishtim instead of Noah, Mount Nisir instead of Mount Ararat), the structure of the two accounts is remarkably similar, and the basic message is the same: that rescue from the deluge is possible if heroic measures are taken.

For the past two decades, Noah's Ark has been used increasingly to generate a positive impression in the public's mind of the conservation of nature within zoos, and increasingly, in botanical gardens. We certainly are facing a deluge of habitat destruction and pending extinction of species around the world.

In the face of that deluge, it's only natural that people try to make a difference. Both zoos and botanical gardens have been working against the tide of extinction, one species at a time. Given the scale of global habitat destruction, climate change and an increasing human population, it's more important than ever to ask if these institutions are having anything more than a minimal impact on conservation.

I've got to be honest about my own point of view, of course. I'm a biologist whose principle academic interest is wildlife biology and evolution. I've worked for the past decade in the context of institutions like the Royal Botanical Gardens (Hamilton/Burlington, Ontario, Canada) because of the degree of public contact they afford. I have also been Executive Director of the Centre for Endangered Reptiles (Granby, Quebec, Canada), an accredited member of the American Zoo and Aquarium Association (AZA), carrying out captive breeding, educational and research projects for critically endangered species. I believe that botanical gardens and zoos are important contributors of efforts to conserve biological diversity, but I also try to be a realist about what we can and cannot do in a garden, no matter how big it may be.

The diversity of institutions that can be called botanical or zoological gardens is staggering, ranging from small road-side attractions owned and operated by individuals to well-funded, professionally-run institutions operated by cities, universities, other levels governments or charitable organizations. Collectively, though, I've started to regard the larger institutions as "biodiversity gardens," because many of the important challenges faced by the conservation of biological diversity are the same for both zoos and botanical gardens. The common thread of biodiversity binds botanical gardens and zoological gardens, and may ultimately be more important than the differences between them.

Success in conservation can be as little as breed a single individual of an endangered species or as much as the protection of the biodiversity of planet Earth. Realistically, however, no single effort, no single individual, and no single institution can hope to "save the Earth." Having an appreciation of how a defined group or class of institutions can make positive, cost-effective contributions to the larger goals of conservation means having an appreciation of both the scale of the goals and also the capacity of the institutions.

Examples of specific conservation programs show that protecting critical habitat and breeding endangered species can be combined as a highly successful strategy, and would not have happened if biodiversity gardens were not involved. These programs include:

- The golden lion tamarin conservation program, involving both habitat protection and rehabilitation in Brazil and the well coordinated captive breeding and reintroduction of animals bred at 150 zoos around the world.

[1] A passage from the Flood Narrative from the Gilgamesh Epic, translation by E.A. Speiser, in *Ancient Near Eastern Texts* (Princeton, 1950), pp. 60-72, as reprinted in Isaac Mendelsohn (ed.), *Religions of the Ancient Near East,* Library of Religion paperbook series (New York, 1955), pp. 100-106.

- The Toromiro conservation program, which is preparing to reintroduce a tree to Easter Island that is extinct in the wild but is being propagated in botanical gardens in Europe and Chile.

- The Puerto Rican crested toad conservation program, involving habitat protection, the creation of ponds in natural habitat, and the breeding and subsequent release of toadlets by North American zoos. To date, more than 4,000 toadlets have been released that have been bred at Toronto Zoo alone.

- The experimental reintroduction program by Fairchild Tropical Garden in Miami for the critically endangered Florida semaphore to determine its actual habitat requirements in anticipation of larger-scale reintroduction efforts.

- The western swamp tortoise conservation program in Western Australia, in which both critical habitat for this endangered species has been identified and protected by the local zoo, which has also undertaken a highly successful captive breeding program that has tripled the number of breeding adults.

Because the focus of biodiversity gardens is primarily individual species, this is where they have the greatest impact. Zoos especially have recognized that they have very limited space and resources, and have directed those resources to considerable effect in specific cases. When those cases have included the conservation of "umbrella" species in the wild (the protection of which also protects other organisms within their habitats) these cases have been highly significant. In some cases, zoos are almost the only institutions directing any conservation effort to critical situations.

Our biodiversity gardens also act as "conservation anchors" to projects in their local community or in more distant habitats. A couple of cases come to mind immediately:

- Royal Botanical Gardens, through its massive habitat rehabilitation project in Cootes Paradise, and the associated work of its Aquatic Plant Nursery, has been a focus for habitat rehabilitation work in wetlands in southern Ontario. The aquatic plant nursery provides plants for other projects, and the expertise and ideas behind the Cootes Paradise Fishway are now being sought for similar projects around the Great Lakes.

- Toronto Zoo has a history of community involvement and also direct participation in *in situ* conservation efforts such as that noted above for the Puerto Rican crested toad. Perhaps the most important effort is Bob Johnson's "Adopt a Pond" effort, in which the zoo has engaged habitat and landscape expertise to provide guidance to the public in the protection and creation of habitat for amphibians.

The conservation successes of biodiversity gardens does not mean that all of them have the same impact as institutions of the scope and capacity of Royal Botanical Gardens, Bronx Zoo, Jersey Zoo, Toronto Zoo, Missouri Botanical Gardens, National Zoo, Calgary Zoo, Monterey Bay Aquarium, or any of the dozens of significant botanical or zoological gardens around the world. As a community of institutions, the major gardens are making significant contributions to the conservation of critically endangered species, but they do not fill all of the gaps.

In effect, the success of botanical gardens and zoos as the refuge of last resort for critically endangered species is an indication of the staggering failure of governments and other agencies responsible for conservation where it really should happen: at the habitat and ecosystem levels. In countries that at least label themselves as democracies, this means that the real responsibility for our present conservation crisis falls directly on the shoulders of the people. It is the people who systematically tolerate governments that claim impotence in dealing with conservation tragedies and that have effectively turned over the fate of most of the natural world to non-elected corporations.

Conservation of endangered species is not the only role of biodiversity gardens: education is just as important. The professionalism and efforts of the education staff of botanical and zoological gardens and related institutions is second to none. As an example of the scale of these efforts, consider the volunteer docent-based public education program at Monterey Bay Aquarium, where 800 volunteers present thousands of hours of public educational contact per week. Monterey Bay Aquarium employs four full-time, qualified biologist-educators who do nothing but develop educational programming for the volunteers, who then carry the information, ideas and enthusiasm to the more than 10,000 visitors per day that visit the facility.

The actual educational impact of gardens is difficult to access, and this is not for lack of effort by the institutions. Let's be frank – the public comes to gardens to see the flowers and zoos to see the animals. For practical purposes, we as visitors treat our biodiversity

gardens as public attractions, not as much of an educational experience. Some studies have been conducted that consist of surveys of zoo visitors before and after their visits in attempts to gauge the degree of "education" received by the visitors during their visits. It is my impression that these surveys tend to have equivocal results, and I expect that this has something to do with the fact that human experience is much more than verbal information. Perhaps the deeper lessons just can't be expressed in words.

In effect, the success of botanical gardens and zoos as the refuge of last resort for critically endangered species is an indication of the staggering failure of governments and other agencies responsible for conservation where it really should happen: at the habitat and ecosystem levels.

There is one simple statistic that indicates the importance of education at our public gardens and the potential it represents: far more people actually visit botanical gardens and zoos in North America each year than to go all professional sporting events combined.

At least by visiting botanical gardens and zoos, those millions have the opportunity to have personal contact with species that would otherwise not be possible. Yes, that contact is lacking the essential and inseparable value of the context of an organism in its natural habitat, and can be labelled an artificial experience and criticized with some justification. However, our public biodiversity gardens do provide the experience of some contact with wildlife for people who would otherwise be shut out of any contact with the wild. It would be both economically impossible and ecologically unsustainable to expose the millions who visit zoos and botanical gardens – and especially the children whose imaginations can be set on fire by a day at a garden or a zoo – to free-living animals and their fragile natural habitats.

Bringing wild animals into contact with the public sometimes raises concerns as to whether zoos are potential sources of disease. This is really a technical issue that should be commented on by epidemiologists, parasitologists and other public health officials, and should be examined in the context of public exposure to other sources of zoonotic infections, including pets and companion animals, urban wildlife and farm animals. I suspect that there is little reason for concern about professionally-operated zoos as a public health risk. Zoological gardens have been bringing animals into cities for decades, and I am not aware of any example in North America of the transmission of an infection from a zoo animal to a member of the public that could not have also happened in the context of other contact with domestic animals, urban wildlife or other common sources.

Certainly, some practices require the application of common sense. Petting zoos, for example, present the public with direct physical contact with (usually domestic) animals. The same public health measures (washing hands, keeping hands out of mouths, etc.) that should be common sense when in contact with any domestic animal should also be in effect when dealing with zoo animals. Zoo animals are among the most closely watched for their physical health. All major zoos have professional veterinary care for their animals, and take both the health of their animals and the responsibility to public health and safety that the collections represent very seriously. In order to be accredited by AZA, the veterinary practices of individual zoos are subject to regular on-site veterinary peer review and inspection. Our farms should be so well regulated.

Human health is very important, but so is the health of ecological systems. As a species, we are limited by our capacity to understand the consequences of our actions. Botanical gardens and zoos provide both positive and negative examples of our lack of foresight. Increasing numbers of plant species that are now known to be extinct in the wild are being found in botanical garden collections, for example. These specimens were almost never collected for the purpose of the prevention of species-level extinction. Botanical gardens have also been involved in more than a few introductions of damaging and invasive exotic plants. On balance, however, other human activities, from farming and the creation of canals to ornamental horticulture and the release of unwanted pets into wild habitats, are responsible for far more ecological disruption that can be blamed on botanical gardens or zoos.

Of course, captive breeding and the work of zoos on behalf of conservation has its limits. Gardens, even the best of them, are limited by financial, physical and human resources. Practical limits to the number of individuals that can be supported within captive facilities are increasingly forcing zoos to make difficult decisions about their collections. Spaces within zoos that may be occupied by popular display animals may be needed for endangered species.

Has captive breeding made the difference between survival and extinction for endangered species? In some cases, yes, it definitely has. Can more be done?

Yes, and it should be. Can captive breeding solve all conservation problems or preserve all endangered species? No, of course not. No one should think it can, nor promote it as such.

The successes of captive breeding and garden conservation are valuable examples of what can be done to stem the tide of extinction if sufficient resources can be brought to bear. While I believe that this role is important and must continue, I also have a healthy degree of scepticism as to the deeper message of captive conservation, which is in no way a criticism of the institutions involved. In fact, over the past decade zoos in particular have been increasingly directing their attention to doing everything they can to promote conservation in the wild. Some of the largest American zoos now view their real role as acting as outposts that can gather resources in the affluent west and direct those resources to protecting habitat and populations in the wild, especially in the developing world.

This is not yet a universal model: many biodiversity gardens operate as city attractions subsidized by public monies, and thus have a hard time justifying the diversion of tax-raised resources to the cause of conservation in another country, no matter how effective or worthwhile. A much larger proportion of the garden community are able to at least support public fund-raising for *in situ* conservation, and do.

These heroic efforts certainly call to mind the hopes and labors of Utnapishtim/Noah to save his family and livestock, but I think that the ancient flood story is actually the wrong analogy for our efforts. Biodiversity gardens are not Noah's Arks - they are much more like the lifeboats on the Titanic. Yes, some species will be saved by the lifeboats/gardens, and there will be stirring stories of heroism and tragedy associated with the rescue. Sadly, many more will die than will be saved, and more could be saved if there were more/bigger lifeboats/gardens.

However, no matter how many lifeboats/gardens are on hand, their use is an emergency response forced upon us by a deeper crisis for which they are not responsible, and for which they can offer only temporary salvation. The real responsibility for the present extinction crisis rests at human society's collective feet for putting our magnificent ship/planet on an unsafe path in the first place. We are all a little like the Titanic's Captain Smith, charging at full speed into the darkness, oblivious to the risks posed by our actions and ultimately unable to be "responsible" for the consequences. Smith, of course, went down with his ship...

May we fare better.

For further reading:

- I recommend an article on organizing responses to environmental crises entitled "'Not on Our Watch": The Biodiversity Crisis and Global Collaboration Response' by Frances Westley (in *Organization & Environment*, Vol. 10, Issue 4 - Dec. 1997), which details the rise of the CBSG as a practical and tractable response to a global, intractable crisis.

- Information on "Strategies for Survival," a conference on the role of botanical gardens in conservation held at Chicago Botanical Garden in 1999, is available on the Web at: http://doug.nslsilus.org/chs/index.cfm

- The Web Site of the Conservation Breeding Specialist Group of the Species Survival Commission of IUCN provides information on assessing the scale of rescue efforts necessary for critically endangered species: http://www.cbsg.org

- The Species Survival Plan of the American Zoo and Aquarium Association (AZA) is the best example of a well-developed captive breeding program in zoos: http://www.aza.org

- AZA has also prepared a study of the collective impact of its members that may also be helpful in further evaluating your statements, including their effects in both conservation and education: http://www.aza.org/dept/PublicA/impactA.htm

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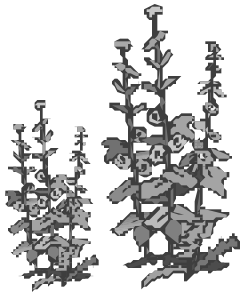
An earlier version of this article first appeared in the Spring, 2000 issue of Pappus, the member's magazine of Royal Botanical Gardens. Reprinted by permission.



Announcements

Zoo News Listserve

Anyone interested in zoos and issues related to the management and conservation of captive populations should consider subscribing to the Zoo News Digest coordinated by Peter Dickson. Zoo News Digest is distributed electronically each week to subscribers in 80 countries and contains links to news articles related to zoos. Also provided is information on upcoming meetings, job openings, volunteer opportunities, and web sites of interest. Zoo professionals interested in husbandry issues may also subscribe to the Zoo Biology listserve, which provides an international forum for discussion of animal husbandry issues. To subscribe to Zoo News Digest, contact Peter Dickinson at: Peter@elvinhow.prestel.co.uk

New Master Programs

Several new Masters programs are now being offered by the Department of Zoology and Entomology, University of Pretoria, South Africa: Systematics and Conservation Evaluation; Conservation Ecology and Planning; and African Mammalogy. For more information, contact: Prof. Clarke Scholtz, Dept. of Zoology and Entomology, University of Pretoria, Pretoria 0002, South Africa; email: chscholtz@zoology.up.ac.za or visit: www.up.ac.za/zoology/top.htm

Hard to Find Publications

Herpetological and natural history publications for sale (new, used, out-of-print). For more information, contact: Paul Gritis Books, PO Box 283, Coopersburg, PA 18036 USA; ph/fax: +01-610-282-6861; email: pgritis@yahoo.com

New Telephone Numbers

Please note that the CBSG and ISIS offices in Minnesota now have new telephone and fax numbers:

CBSG Office telephone:	01-952-997-9800	ISIS Office telephone:	01-952-997-9500
CBSG (Virginia office):	01-540-465-9589	CBSG/ISIS fax:	01-952-432-2757

2000 CBSG Annual Meeting

Hosted by The Living Desert, the 2000 Annual Meeting of the IUCN/SSC Conservation Breeding Specialist Group will be held on 20 – 22 October in Palm Desert, California, USA, followed by the IUDZG/ WZO meeting on 23 – 26 October. Look for a summary of the meeting presentations and working group reports in the next issue of *CBSG News*. We hope to see you there!

Like our workshops, the CBSG annual meetings have covered the globe. How many of the past CBSG meetings have you attended?

1989	San Antonio, TX, USA	North America
1990	Copenhagen, Denmark	Europe
1991	Singapore, Singapore	Asia
1992	Vancouver, BC, Canada	North America
1993	Antwerp, Belgium	Europe
1994	Sao Paulo, Brazil	South America
1995	Dublin, Ireland	Europe
1996	Denver, CO, USA	North America
1997	Berlin, Germany	Europe
1998	Yokohama, Japan	Asia
1999	Warm Baths, South Africa	Africa
2000	Palm Desert, CA, USA	North America
2001	Perth, Australia	Australasia

CBSG *News*

Newsletter of the Conservation Breeding Specialist Group
Species Survival Commission
IUCN – World Conservation Union

May We Discuss Another Issue?

CBSG News is currently distributed to a network of more than 800 CBSG members and conservation professionals in 170 countries. In order to keep up with increasing expenses for the printing and distribution of *CBSG News*, we are asking for contributions from readers in hard currency countries who feel they can afford to help us defray these costs. If you would like to assist CBSG with these expenses, please take a moment to fill out the coupon below. Suggested contribution is US $35. Thank you for your support.

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