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CONSERVATION ASSESSMENT AND MANAGEMENT PLANS (CAMPs) and GLOBAL CAPTIVE ACTION PLANS (GCAPs)

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Reduction and fragmentation of wildlife populations and habitats are occurring at a rapid and accelerating rate. The results for an increasing number of taxa are small and isolated populations that are at risk of extinction. For such populations, more intensive management becomes necessary for their survival and recovery. To an ever increasing extent, this intensive management will include, but not be limited to, habitat management and restoration, intensified information gathering, and captive breeding.

The problems for wildlife are so enormous that it is vital to apply the limited resources available for intensive management as efficiently and effectively as possible. Conservation Assessment and Management Plans (or CAMPs) and their derivative Global Captive Action Plans (GCAPs) are being developed to respond to this need.

Conservation assessment and management plans (CAMPs)

CAMPs are intended to provide strategic guidance for application of intensive management and information collection techniques to threatened taxa. CAMPs provide a rational and comprehensive means of assessing priorities for intensive management, sometimes including captive breeding, within the context of the broader conservation needs of threatened taxa.

Within the Species Survival Commission (SSC) of IUCN, the primary goal of the Captive Breeding Specialist Group (CBSG) is to contribute to the development of holistic (i.e. integrating in situ and ex situ) and viable conservation strategies and action plans by the taxon-based Specialist Groups of the SSC and BirdLife International (formerly the International Council for Bird Preservation, ICBP). CAMPs are conducted as collaborative ventures of CBSG with the taxon-based Specialist Groups of the IUCN and ICBP; generally, representatives of Taxon Advisory Groups (TAGs) of the organized Regional Captive Breeding Programs of the zoo/aquarium world are also included. Hence, the CAMP process assembles a broad spectrum of expertise on wild and captive management of the taxa under review.

A CAMP workshop brings together 10-40 experts (e.g., Specialist Group members, wildlife managers, representatives of the academic community or the private sector, and captive managers) to evaluate the threat status of all taxa in a broad group (e.g., an order or family), to set conservation action and information-gathering priorities. It is an attempt to develop a process that will: 1) make broad-based recommendations concerning management; and 2) recommend specific conservation-oriented research that might be needed to directly contribute to the knowledge needed to develop comprehensive management and recovery programs.

The CAMP process is also providing an opportunity to test the applicability of the Mace-Lande Categories and Criteria (Mace & Lande, 1991) for assessment of threat. The Mace-Lande system is being considered as the temporary template for the IUCN Categories of Threat, which are still under active development. The scheme attempts to assess threat in terms of likelihood of extinction within a specified period of time. The proposed system defines three categories for threatened taxa:

Critical	50% probability of extinction within 5 years or 2 generations, whichever is longer.
Endangered	20% probability of extinction within 20 years or 10 generations, whichever is longer.
Vulnerable	10% probability of extinction within 100 years.

Criteria are proposed to estimate the probability for extinction of taxa based on information about size, distribution, and trend of their population as well as conditions of their habitat now and in the future. Their purpose is to provide a system that make the categories of threat more explicit, with wider applicability to multiple taxa. This system is more objective and rational than previous schemes have been. Characteristics are that it:

1) is simple, with few categories;
2) is a probabilistic assessment of risk;
3) has flexible data requirements;
4) can use flexible population units;
5) uses clear terminology;
6) uses a biologic time-scale of years and generations.

The criteria are based on population viability theory (Gilpin & Soulé, 1986; Soulé 1987a, 1987b). Mace and Lande acknowledge that in most cases there will be insufficient data and imperfect models on which to base formal probabilistic analysis. For broader and cruder assessments they propose "more qualitative" but in large part still quantitative criteria for assessing threat in terms of population sizes (total and effective), fragmentation, trends, and stochasticity for each category.

The CAMP process itself is intensive and interactive. Workshop participants develop the assessments of risks and formulate recommendations for action using a spreadsheet with columns that require participants to provide data on the status of populations and habitat in the wild. These sheets also permit entry of the recommendations for intensive action. Spreadsheets are augmented with Taxon Data Sheets for each taxon under review. Taxon Data Sheets provide documentation of reasoning behind recommendations, and may include data that does not fit into the spreadsheet format or details of other pertinent information.

During a CAMP workshop, the wild and captive status of all taxa are reviewed, on a taxon-by-taxon basis, for the broad taxonomic group under consideration. There is an especial attempt to estimate the total population of each taxon. It is often very difficult, even agonizing, to be numerate because so little quantitative data on population sizes and distribution exists. However, with encouragement and mediation from workshop organizers it is frequently possible to provide order-of-magnitude estimates, especially whether the total population is greater or

less than the numerical thresholds for the three Mace-Lande categories of threat. The CAMP process attempts to be as quantitative or numerate as possible for two major reasons:

- Action plans ultimately must establish numerical objectives for population sizes and distribution if they are to be viable.

- Numbers provide for more objectivity, less ambiguity, more comparability, better communication and hence cooperation.

CAMPs assess the degree of threat for each taxon in the wild and recommend intensive action that may reduce the risks for threatened taxa. For this purpose, the process utilizes information from SSC Action Plans that may already have been formulated by the taxon-based Specialist Groups as well as additional data from experts on the taxa. CAMPs have been endorsed by the SSC as the logical first step toward the development of taxonomic Action Plans where they do not yet exist. The CAMP process produces the necessary assessment of status and prospects to facilitate formulation of Global Action Plans for both ex situ and in situ efforts.

In assessing threat, the CAMP process also uses information on the status and interaction of other population and habitat characteristics in addition to the guesstimates of total number. Recent CAMP spreadsheets have included a "data quality" column so that guesstimates can be distinguished from population estimates based on solid documentation. Information about population fragmentation and trends as well as habitat changes and environmental stochasticity are also considered. For example, total numbers alone might indicate that a taxon be assigned to the Vulnerable category. However, the taxon may be assigned to the Endangered category based on knowledge that the population is severely fragmented, is declining rapidly, or that its habitat is under serious threat so that the probability of and time to extinction place it at higher risk.

During the CAMP process, each taxon is assigned to one of five categories: Critical, Endangered, Vulnerable, Safe, or Unknown. Assignment to Mace-Lande category of threat is for all CAMPs held thus far is summarized in Table 1, with the exception of marsupials for which data are still being summarized. In assigning priorities, there is also an attempt to consider the taxonomic distinctiveness of each taxon although this aspect of the process is at an earlier stage of evolution. Concerning taxonomy, the most conservative approach, relative to the preservation of biodiversity, is to attempt risk assessment and management recommendations initially in terms of the maximal distinction among possible "subspecies" until taxonomic relationships are better elucidated. Splitting rather than lumping maximizes preservation of options. Taxa can always be merged ("lumped") later if further information invalidates the distinctions or if biological or logistic realities of sustaining viable populations precludes maintaining taxa as separate units for conservation.

Based on assessments carried out during CAMP workshops, a set of recommendations about which taxa are in need of various kinds of intensive management and information gathering is generated. Recommendations for intensive action for CAMPs conducted thus far are presented in Table 2 (with the exception of marsupials and Galliformes, which are still being summarized) and include:

1) the need for Population and Habitat Viability Assessment (PHVA) workshops;
2) broad-based recommendations for intensive protection and management in the wild;
3) in situ and ex situ conservation-oriented research that can directly contribute to the knowledge needed to develop comprehensive management and recovery programs;
4) captive propagation programs;
5) genetic resource banking and application of reproductive technology

These last techniques will become increasingly available to enhance populations of animals in captivity and the wild; major initiatives are under way to establish a comprehensive and coordinated system of genetic resource banks.

Over the past two years, CAMPs have been carried out for a wide spectrum of the vertebrates: boid and pythonid snakes; varanid and iguanid lizards; penguins; waterfowl; megapodes; quail, partridges and francolins; pheasants; pigeons and doves; cranes; parrots; Asian hornbills; Hawai'ian forest birds; marsupials; primates; canids and hyenas; procyonids; mustelids; viverrids; felids; cervids; antelope; and Caprinae. The first plant CAMP was conducted for St. Helena Island in May 1993. CAMP workshops have been conducted around the world: parrots, waterfowl, and Galliformes (excluding Cracids) in the United Kingdom; Asian hornbills in Singapore; marsupials in Australia; penguins in New Zealand; primates, canids, felids, deer and Caprinae in the United States; antelope in the United States and in South Africa. Review sessions for these CAMPs are being conducted in conjunction with regional CBSG meetings in Venezuela, Australia, Japan, the United Kingdom, India, and South Africa. More than 450 persons representing 14 taxon-based Specialist Groups and the 12 organized regional captive propagation programs of the zoo world have participated in the initial workshops and review sessions. Reports from CAMP workshops are available from the CBSG Office.

Global captive action plans

An important product that comes out of the CAMP process is a Global Captive Action Plan (GCAP), which attempts to provide a strategic overview and framework for effective and efficient application and allocation of captive resources to conservation of the broad group of taxa of concern (i.e., an order, family, etc.). GCAP's provide strategic guidance for captive programs at both the Global and Regional level in terms of captive breeding and also possible other support (technical, financial) for in situ conservation. More specifically, GCAPs recommend which taxa are most in need of captive propagation and hence

1) which taxa in captivity should remain there,
2) which taxa not yet in captivity should be there, and
3) which taxa currently in captivity should no longer be maintained there.

Where captive programs are indicated, there is an attempt to propose the level of captive programs required, reflecting status and prospects in the wild as well as taxonomic distinctiveness. The level of captive program is defined by its genetic and demographic objectives which translate into a target population size that will be required to achieve these objectives. Target population depends on a number of factors:

- level of demographic security
- kind and amount of genetic diversity
- period of time
- size of the wild population
- size of other captive populations of similar species
- reproductive technology available

There will be multiple genetic and demographic objectives depending on the status and prospects of the taxon in the wild and hence different captive population targets: some taxa need large populations for a long time; others need small incipient nuclei or reduced gene pools that can be expanded later if needed. Computer models and software exist to establish rough targets now. Adjustments to current sizes of captive populations will be a result of these recommendations.

The approximate scheme that has evolved so far for Global Captive Action Plans is:

Captive Recommendation	Level of Captive Program
I-1	Captive population should be developed and managed that is sufficient to preserve 90% of the genetic diversity of a population for 100 years (90%/100). Program should be

developed within 3 years. This is an emergency program based on the present availability of genetically diverse founders.

I-2 Initiate a captive program in the future, within 3 or more years. Captive population should be developed and managed that is a nucleus of 50-100 individuals organized with the aim to represent as much of the wild gene pool as possible. This program may require periodic importation of individuals from the wild population to maintain this high level of genetic diversity in a limited captive population. This type of program should be viewed as protection against potential extirpation of wild populations.

N A captive program is not currently recommended

Np A captive program is not currently recommended but may be reconsidered pending further data

This system proposes that captive populations should be treated as an integral part of the metapopulations being managed by conservation strategies and action plans. Viable metapopulations often may need to include captive components (Foose et al., 1987). The IUCN Policy Statement on Captive Breeding (IUCN, 1987) recommends in general that captive propagation programs be a component of conservation strategies for taxa whose wild population is below 1,000 individuals. It is proposed that captive and wild populations should and can be intensively and interactively managed with interchanges of animals occurring as needed and as feasible. There may be many problems with such interchanges including epidemiologic risks, logistic difficulties, financial limitations, etc. But with effort, based on limited but growing experience, these can be resolved. The bottom line is that strategies and priorities should try to maximize options and minimize regrets. Captive populations are support, not a substitute, for wild populations. This kind of system is the premise on which the proposals for captive nuclei are predicated. Basically, these nuclei would be small populations in captivity that would need to be subsidized genetically, and perhaps demographically, from the wild while natural populations are still large enough to fulfill this function without significant detriment ("Not of Concern", "Vulnerable"). This system would normally require the addition of one or two wild-caught individuals per generation to the captive nucleus. If and when the wild populations declined into a greater state of threat (i.e. "Endangered"), this subsidization would cease and the nucleus could be expanded into a full program that ultimately would reinforce (subsidize) the wild population.

The program goal for 90%/100 Years is different from what has been recommended as the general guideline for captive programs in the past (Foose, et al., 1986), i.e., 90% of genetic diversity for 200 years. A shorter time period is proposed for three reasons:

- It buys time for more taxa that might be excluded from captive programs if a longer time period (e.g., 200 years) is adopted.
- It maintains more incentive to secure or restore viable populations in situ.

GCAPs are developed by a Global Action Plan Working Group which includes representatives from each of the Regional Captive Programs. The GCAPs provide a strategic framework within which the Taxon Advisory Groups (TAGs) in the various organized Regions (ASMP, EEP, SSP, SSCJ) of the zoo and aquarium world will formulate and implement their own Strategic Regional Collection Plans. In reality, Global and the Regional Plans will be interactively and iteratively developed. The Regional TAGs are integrally involved in the development of the Global Captive Action Plans.

Ideally, the Regional TAGs then consider this first draft of the GCAP within a regional context to develop a draft of a Regional Collection Plan (RCP). Once draft Regional Plans are formulated, the GCAP process continues as the RCPs of various regions are reviewed at the global level in an attempt to coordinate and, where necessary and agreeable, adjust Regional priorities in an attempt to maximize effectiveness of the international captive community in responding to conservation needs. The GCAP and RCP process are thus both interactive and iterative. In this way RCPs of the various Regions will not develop in isolation from one another and captive resources can be allocated efficiently and effectively to taxa in need.

Ultimately, the GCAP will recommend how responsibilities for captive programs might best be distributed among organized Regions of the global captive community. Further, the Global Captive Action Plan Working Groups will facilitate interaction and coordination among Regional TAGs as they develop their Regional Collection Plans and Regional Breeding Programs in an attempt to optimize use of captive space and resources for conservation on an international basis. The GCAPs must confront the realities of limitation in captive habitat (i.e., space and other resources). The priorities for captive propagation must be reconciled by the potential or capacity of zoos and aquaria. TAGs in many Regions are now conducting surveys of the amount of captive space available. These surveys are rather sophisticated considering the captive ecologies and taxonomic affinities of the taxa, zoogeographic themes of the institutions. Obviously the size of populations that can be maintained will be determined by the number of taxa for which programs are developed. The Regional TAGs will most accurately assess captive holding/exhibit space in their Regions using surveys and censuses to supplement studbook databases, ISIS records, national or regional inventories, etc.

It is through the Regional Collection Plans and the Regional Breeding Programs developed under them that the recommendations of the Global Captive Action Plans will be realized. However, to maximize the efficiency and effectiveness of captive resources, Regional Programs will need to be integrated and coordinated to form global programs or Global Animal Survival Plans (GASPs). Programs and masterplans for propagation and management now exceed 200 in the various regions of the zoo/aquarium world and development is in progress to form global programs (GASPs) for at least a dozen taxa.

Any and all taxa that are maintained in captivity should be managed as populations. Hence, once taxa are selected for captive propagation, they must be managed by Regional (RCP) and Global (GCPP or GASP) Captive Propagation Programs. Therefore there should be studbooks, coordinators, masterplans, taxon advisory groups or other management provisions for these taxa. Moreover, animal spaces as well as the animals themselves should be managed. If zoos and aquaria are to respond to the great need for captive programs, management will increasingly need to be more collective, i.e., more through Taxon Advisory Groups rather than individual taxon management and/or propagation committees.

While captive breeding programs are emphasized in the GCAPs, the Plans also attempt

1) to identify where and how the captive community can assist with transfer of intensive management information and technology
2) develop priorities for the limited financial support the captive community can provide for in situ conservation (e.g., adopt-a-sanctuary programs).

The Review process for CAMPs and GCAPs

The results of the initial CAMP and GCAP workshops are published as a Review Edition of a Conservation Assessment and Management Plan. Draft CAMPs are reviewed: 1) by distribution to 100-200 wildlife managers and regional captive programs worldwide for comment; 2) at regional review sessions at various CBSG meetings and workshops, utilizing local expertise

with the taxonomic group in question. Thus CAMP and GCAP workshops are not single events although sometimes they are singular events. Instead, they are part of a continuing and evolving process of developing conservation and recovery plans for the taxa involved. The CAMP review process allows extraction of information from experts worldwide. CAMPs are continuously evolving as new information becomes available and as global and regional situations and priorities shift. In nearly all cases, follow-up workshops will be required to consider particular issues in greater depth or on a regional basis. Moreover, some form of follow-up will always be necessary to monitor the implementation and effectiveness of the recommendation resulting from the workshop. In many cases a range of PHVA workshops will result from the CAMP workshops.

CAMPs are "living" documents that will be continually reassessed and revised based upon new information and shifting needs. The current CAMP and GCAP process will continue both by its application to new groups of taxa and the refinement of the ones already under way. Over the next five years it is intended to initiate the CAMP/GCAP process for all terrestrial vertebrate groups (the so-called tetrapods) and for selected fish groups. CAMPs will also be conducted for selected invertebrate and, beginning in May 1993, for plant groups.

The CAMP process is central to establishment of global priorities for intensive conservation action. CAMPs provide a global framework for intensive management in the wild for captivity. Wildlife Agencies and Regional Captive Breeding Programs can use the CAMPs as guides as they develop their own action plans. The long-term impact of the CAMP process on global priority setting will be important. Within the near future, and for the first time, wildlife and zoo animal managers worldwide will have a set of comprehensive documents at their disposal, collaboratively and scientifically developed, which establish priorities for global wild and captive species management and conservation. Ultimately, these processes will catalyze the wise worldwide use of limited resources for species conservation.

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TABLE 1
ASSESSMENT OF THREAT

	TOTAL TAXA	CRIT[1]	END[2]	VUL[3]	SAFE	UNK[4]	TOTAL THREATENED
BOIDAE/ PYTHONIDAE	159	4	13	31	108	3	48 (30%)
VARANIDAE	65	0	2	23	29	11	25 (38%)
IGUANIDAE	66	3	10	27	14	12	40 (60%)
PENGUINS (preliminary)	24	0	3	7	11	3	10 (41%)
WATERFOWL	234	10	24	43	157	0	77 (33%)
GALLIFORMES (excluding Cracidae)	245	5	25	61	142	12	91 (37%)
PIGEONS & DOVES	352	14	29	50	222	37	93 (26%)
CRANES	31	9	7	7	8	0	23 (74%)
PARROTS	428	25	36	78	228	61	139 (32%)
ASIAN HORNBILLS	52	5	15	24	9	0	44 (85%)
HAWAI'IAN FOREST BIRDS	65	22	12	23	0	8	57 (88%)
PRIMATES	512	59	69	93	291	0	221 (43%)
CANIDS, HYAENAS	225	8	10	16	191	0	34 (15%)
PROCYONIDAE	20	7	3	2	7	1	12 (60%)
MUSTELIDAE	60	3	5	1	35	5	20 (33%)
LUTRINAE	19	0	4	9	3	3	13 (68%)
VIVERRIDAE	49	2	12	11	20	4	25 (51%)
HERPESTINAE	42	0	4	8	23	7	12 (28%)
FELIDS	264	31	60	104	69	0	195 (74%)
CERVIDS	164	21	29	23	60	31	73 (44%)
ANTELOPE	395	9	21	46	87	232	76 (19%)
CAPRINES	87	10	22	30	25	0	62 (71%)
TOTAL	3,559	247	415	729	1,739	430	1,344
(%)		(6%)	(12%)	(20%)	(49%)	(12%)	(38%)

[1]Critical; [2]Endangered; [3]Vulnerable; [4]Status unknown

TABLE 2
NUMBER OF INTENSIVE ACTION RECOMMENDATIONS

	TOTAL TAXA	PHVA	MORE IN SITU MGMT	RESEARCH	CAPTIVE BREEDING
BOIDS/PYTHONIDS	159	20	29	94	57
VARANIDS	65	5	32	57	26
IGUANIDS	66	21	42	62	30
PENGUINS (preliminary)	24	17	14	24	13
WATERFOWL	234	92	173	166	150
PIGEONS & DOVES	352	35	77	53	40
CRANES	31	25	23	27	24
PARROTS	428	125	175	199	169
ASIAN HORNBILLS	52	35	15	50	45
HAWAI'IAN FOREST BIRDS	65	23	59	59	15
PRIMATES	512	136	37	192	229
CANIDS, HYAENAS	225	14	22	47	33
PROCYONIDS	20	10	9	40	12
MUSTELIDS	60	7	37	78	12
LUTRINAE	19	3	19	39	2
VIVERRIDS	49	9	20	56	7
HERPESTINAE	42	5	13	40	6
FELIDS	264	30	80	120	98
CERVIDS	164	45	27	127	55
ANTELOPE	395	62	111	119	138
CAPRINAE	87	51	73	93	31
TOTAL	3,314	770	1,087	1,742	1,192