CRACID GLOBAL CAPTIVE ACTION RECOMMENDATIONS

WORKING DOCUMENT

December 1995

Report from the workshop held
1-3 October 1994

Edited and Compiled by
Luud Geerlings, Alan Rost, Chelle Plasse, Dave Thompson, Stuart Strahl, Onnie Byers

A Collaborative Workshop

Birdlife Int'l/World Pheasant Association/IUCN/SSC Cracidae Specialist Group

AZA Cracid Taxon Advisory Group

EEP Cracid Taxon Advisory Group

IUCN/SSC Conservation Breeding Specialist Group

NORTH AMERICAN CRACID TAG

Cracid Specialist Group

HOUSTON Zoological Gardens

A Division of the Houston Parks and Recreation Department

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CRACID
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EXECUTIVE SUMMARY

Of the 88 distinct Cracid taxa considered by participants during the Cracid Conservation Assessment and Management Plan workshop, 49 species/subspecies (in various categories of threat according to the Draft IUCN Red List criteria) were assigned to one of 3 levels of captive programs:

Level 1	27 taxa (10 Critical, 7 Endangered, 9 Vulnerable, 1 Low Risk)
Level 2	9 taxa (1 Critical, 2 Endangered, 4 Vulnerable, 2 Conservation Dependent)
Level 3	13 taxa (11 Low Risk, 2 Vulnerable)

Captive programs for 14 taxa were listed as "pending", meaning that recommendations for these taxa would be postponed until further information was available, either from survey, a PHVA, or other sources. The remaining 25 taxa were identified as not requiring captive programs.

Target populations were computed for 58 taxa during the Global Captive Action Recommendations workshop. Global captive population targets ranged from 76 to 246 individuals. In 17 cases (28.8%), the target population is lower than the current global captive population indicating a recommendation to manage the captive population toward a decrease in numbers or for complete elimination from captive programs as part of a strategy to accommodate as many species/subspecies as possible of higher conservation priority. In the remaining 42 taxa (71.2%), the recommended target population constitutes an increase in the current captive populations.

Regional information has been obtained from 17 regions or countries and one institution (Estudillo). Each region/country/institution currently maintains captive programs for several taxa:

Mesoamerica	2 taxa	Colombia	9 taxa
South America	4 taxa	Estudillo	42 taxa
Mexico	10 taxa	Israel	1 taxon
Peru	2 taxa	Dominican Republic	1 taxon
Guatemala	7 taxa	Costa Rica	3 taxa
Venezuala	18 taxa	North America	16 taxa
Brazil	31 taxa	Europe	30 taxa
Bolivia	5 taxa	Australasia	1 taxa
Argentina	4 taxa	Japan	5 taxa

In one or more of these countries/regions, captive programs currently exist for 42 (84%) of the 50 Cracid taxa recommended for captive management. However, 11 (26%) of these 42 taxa have 10 or fewer individuals currently in captivity.

All calculations of Draft IUCN Red List criteria and all recommendations are based on estimates of wild population numbers and trends and on estimates of habitat area and conditions. As with all CBSG programs, the GCAR process is continually evolving as additional workshops are held and as reports from completed workshops are reviewed. Similarly, the GCAR document is a "living" set of guidelines, meaning that it will be reassessed and revised continually based upon new information and shifting needs. As additional regional information regarding current and planned population sizes becomes available, it will be incorporated into this document and made available to the various regions of the zoo world to serve as a guide when planning or revising regional collections.

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SECTION 1

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SECTION 1

GLOBAL CAPTIVE ACTION RECOMMENDATIONS FOR CRACID

GLOBAL CAPTIVE ACTION RECOMMENDATIONS (GCAR) FOR CRACIDS

Introduction

Reduction and fragmentation of wildlife populations and habitat are occurring at a rapid and accelerating rate. For an increasing number of taxa, the results are small and isolated populations at risk of extinction. A rapidly expanding human population, now estimated at 5.25 billion, is expected to increase to 8 billion by the year 2025. This expansion and concomitant utilization of resources has momentum that cannot be stopped, the result being a decreased capacity for all other species to simultaneously exist on the planet.

As wildlife populations diminish in their natural habitat, wildlife managers realize that management strategies must be adopted that will reduce the risk of extinction. These strategies will be global in nature and will include habitat preservation, intensified information gathering, and in some cases, scientifically managed captive populations that can interact genetically and demographically with wild populations.

Within the Species Survival Commission (SSC) of IUCN-The World Conservation Union, the primary goal of the Conservation Breeding Specialist Group (CBSG) is to contribute to the development of holistic and viable conservation strategies and management action plans. Toward this goal, CBSG is collaborating with agencies and other Specialist Groups worldwide in developing scientifically-based processes, on both a global and regional basis, with the goal of facilitating an integrated approach to species management for conservation.

In addition to managing the natural habitat, conservation programs leading to viable populations may sometimes require a captive component. In general, captive populations and programs, or the use of captive technologies, can serve several roles in holistic conservation: 1) as genetic and demographic reservoirs that can be used to reinforce wild populations either by revitalizing populations that are languishing in natural habitats or by re-establishing by translocating populations that have become depleted or extinct; 2) providing scientific resources for information and technology that can be used to protect and manage wild populations; and 3) as living ambassadors that can educate the public and generate funds for *in situ* conservation.

It is proposed that, when captive populations or captive technology can assist species conservation, captive and wild populations should, and can be, intensively and interactively managed with feasible interchanges of animals occurring as needed. Captive populations should be a support, not a substitute, for wild populations. There may be problems with respect to disease, logistics and financial limitations. In the face of the immense extinction crisis facing many taxa, these issues must be addressed and resolved immediately.

Captive breeding programs have limited resources. Priorities must be developed cooperatively among all regions of the world for program development and resource allocation, the purpose of the Global Captive Action Recommendation process. Once global priorities are known, regional captive propagation programs can be developed to assist in practical conservation.

Global Captive Action Recommendations (GCARs)

GCARs are derived from the Conservation Assessment and Management Plan (CAMP) process. The CAMP recommends which species/subspecies deserve attention, and the GCAR determines global priorities and a target number of individuals of each taxa needed to sustain a healthy world population. In addition, current distribution of the world's captive population is indicated in an effort to assist discussion, within individual regions, of regional responsibility for carrying out these captive management recommendations. This system assumes that captive populations be treated as an integral part of the metapopulations being managed by conservation strategies and action plans. Viable metapopulations may need to include captive components. The IUCN Policy Statement on Captive Breeding recommends, in general, that captive propagation programs be a component of conservation strategies for taxa in which the wild population is fewer than 1,000 individuals. Captive and wild populations should and can be intensively and interactively managed with interchanges of animals occurring as needed and as feasible, after appropriate analysis. There may be problems with interchanges including epidemiologic risks, logistic difficulties and financial limitations. However, limited but growing experience suggests that these problems can be resolved. Strategies and priorities should maximize options while minimizing regrets for species conservation.

Captive populations are a support and a reservoir, not a substitute, for wild populations. A primary focus of the GCAR is on captive propagation programs that can serve as genetic and demographic reservoirs to support survival and recovery of wild populations in the future. The purpose of the GCAR workshop is to provide strategic guidance for captive management enabling regional programs to interact and combine to catalyze a truly effective global effort. An important aspect is establishing global target population size goals (i.e., how many individuals ultimately to maintain). More specifically, GCARs recommend which taxa are most in need of captive propagation and thus:

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.

There are multiple genetic and demographic objectives affecting the captive population target: some taxa require large population sizes for a long time, where others need small nuclei or reduced gene pools that can be expanded later, if needed. One result of the GCAR will be an ability to logically adjust current captive population sizes in various regions, hopefully to better sustain threatened taxa as well as to identify new space available for conserving other species/subspecies receiving insufficient attention.

In summary, the GCAR provides the strategic framework for establishing global priorities that, in turn, can be used by all regional taxon advisory groups to formulate, coordinate and implement effective Regional Collection Plans that together will have a true global conservation impact.

GCAR Workshop Goals
The goals of the Cracid GCAR were:

1. to prioritize taxa in need of captive management on the basis of the CAMP data;
2. to identify global target population sizes; and
3. to evaluate the contribution of regional collection plans to global conservation of taxa identified as priorities by the GCAR process.

The GCAR Process
A major consideration in establishing priority species for captive management is the category of threat assigned to the taxon. The Draft IUCN Red List criteria (Table 1), were applied to each taxon during the CAMP process. The number of Cracid taxa in the wild by range country or region and by Draft IUCN Red List category of threat is presented in Table 2.

Draft IUCN Red List Categories
The threatened species categories now used in IUCN Red Data Books and Red Lists have been in place, with some modification, for almost 30 years (Mace *et al.*, 1994). The Mace-Lande criteria was one developmental step in an attempt to make those categories more explicit. These criteria subsequently have been revised and formulated into new Draft IUCN Red List Categories, which are now being tested in the CAMP process.

The Draft IUCN Red List Categories (Table 1) provide a system which facilitates comparisons across widely different taxa, and is based both on population and distribution criteria. Like the Mace-Lande criteria, the new criteria can be applied to any taxonomic unit at or below the species level, with sufficient range among the different criteria to enable the appropriate listing of taxa from the complete spectrum of taxa, with the exception of micro-organisms (see Mace *et al.*, 1994, in Section 4).

The categories of Critical, Endangered, and Vulnerable are all nested (i.e., if a taxa qualifies for Critical, it also qualifies for Endangered and Vulnerable). This system introduces a new category of threat "Susceptible." The Draft IUCN Red List Categories are:

EXTINCT (EX) A taxon is **Extinct** when there is no reasonable doubt that its last individual has died.

EXTINCT IN THE WILD (EW) A taxon is **Extinct in the Wild** when it is known only to survive in cultivation, in captivity or as a naturalized population (or population) well outside the past range.

CRITICAL (CR) A taxon is **Critical** when it is facing an extremely high risk of extinction in the wild in the immediate future as defined by Table 1 criteria.

ENDANGERED (EN) A taxon is **Endangered** when it is not Critical but is facing a high risk of extinction in the wild in the near future, as defined by Table 1 criteria.

VULNERABLE (VU) A taxon is **Vulnerable** when it is not Critical or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by Table 1 criteria.

CONSERVATION DEPENDENT (CD) Taxa not currently qualifying under any of the categories above may be classified as **Conservation Dependent**. To be **Conservation Dependent**, a taxon must be the focus of a continuing taxon-specific or habitat-specific conservation program that directly affects the taxon. The cessation of this program would result in the taxon qualifying for one of the threatened categories above.

SUSCEPTIBLE (SU) A taxon is **Susceptible** when it does not qualify as Critical, Endangered, Vulnerable or Conservation Dependent, but there is serious and acute restriction in its area of occupancy (typically < 100 km^2) or in the number of locations (typically <5). Such a taxon thus is prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a short period of time in an unforeseeable future. Taxa in this category are capable of quickly becoming Critical or even Extinct.

LOW RISK (LR) A taxon is **Low Risk** when it has been evaluated and does not qualify for any of the categories Critical, Endangered, Vulnerable, Susceptible, Conservation Dependent or Data Deficient (see below).

DATA DEFICIENT (DD) A taxon is **Data Deficient** when there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.

NOT EVALUATED (NE) A taxon is **Not Evaluated** when it has not yet been assessed against the criteria.

Table 1. DRAFT IUCN RED LIST CATEGORIES

ANY of the following criteria may be used to assign categories:	CRITICAL	ENDANGERED	VULNERABLE
Population reduction	≥ 80% decline in last 10 yrs based on:	≥ 50% decline in last 10 yrs or 2 generations based on:	≥ 50% decline in last 20 yrs or 5 generations based on:
	a) direct observation OR b) decline in area of occupancy, occurrence and/or habitat quality OR c) actual or potential levels of exploitation OR d) introd. taxa, hybridization, pathogens, pollutants, competitors or parasites		
	OR	OR	OR
	≥ 80% decline/10yrs predicted in near future	≥ 50% decline/10 yrs or 2 generations predicted in near future	≥ 50% decline/20 yrs or 5 generations predicted in near future
Extent of occurrence	Est. < 100 km² or area of occupancy est. < 10 km², AND TWO of the following:	Est. < 5,000 km² or area of occupancy est. < 500 km², AND TWO of the following:	Est. < 20,000 km² or area of occupancy est. < 2,000 km², AND TWO of the following:
	Severely fragmented OR single location.	Severely fragmented OR ≤ 5 locations	Severely fragmented OR ≤ 10 locations
	Decline in ANY of the following: a) extent of occurrence b) area of occupancy c) area, extent, and/or quality of habitat d) # of locations or subpopulations e) # of mature individuals		
	Extreme fluctuations in ANY of the following: a) extent of occurrence b) area of occupancy c) # of locations or subpopulations		
Population estimates	Est. < 250 mature indivs. AND:	Est. < 2,500 mature indivs. AND:	Est. < 10,000 mature indivs. AND:
	Decline ≥ 25% within 3 yrs or one generation, whichever is longer	Decline ≥ 15% within 5 yrs or 2 generations, whichever is longer	Decline ≥ 20% within 10 yrs or 3 generations, whichever is longer
	OR	OR	OR
	Decline in mature individuals AND population structure EITHER a) no pop. w/ > 50 mature indivs. OR b) all indivs. in single subpop.	Decline in mature individuals AND population structure EITHER a) no pop. w/ > 250 mature indivs. OR b) all indivs. in single subpop.	Decline in mature individuals AND population structure EITHER a) no pop. w/ > 1,000 mature indivs. OR b) all indivs. in single subpop.
# of mature individuals	Est. < 50 mature individuals	Est. < 250 mature individuals	Est. < 1,000 mature individuals
Probability of extinction	≥ 50% within in 5 yrs or 2 generations, whichever is longer	≥ 20% within 20 yrs or 5 generations, whichever is longer.	≥ 10% within 100 yrs

Table 2. Number of cracid taxa in the wild by range country or region and by Draft IUCN Red List category of threat.

REGION/ COUNTRY	DRAFT IUCN RED LIST CATEGORY							TOTAL
	CRITICAL	ENDANG	VULNER	CONSERVATION DEPENDENT	LOW RISK	DATA DEFICIENT	NOT EVALUATED	
ARGENTINA	0	1	5	0	3	1	0	10
BELIZE	0	0	1	0	1	0	0	2
BOLIVIA	1	1	5	2	12	1	0	22
BRAZIL	4	1	11	0	16	0	0	32
COLOMBIA	2	6	7	3	16	1	0	35
COSTA RICA	0	1	1	0	1	0	0	3
DOMINICAN REPUBLIC	0	0	0	0	0	0	0	0
ECUADOR	0	3	4	3	5	0	0	15
EL SALVADOR	0	1	0	0	1	0	0	2
FRENCH GUIANA	0	0	0	0	4	0	0	4
GUATEMALA	1	1	1	0	2	2	0	7
GUYANA	0	0	0	0	6	0	0	6
HONDURAS	1	1	1	0	2	0	0	5
MEXICO	2	2	2	0	7	0	0	13
NICARAGUA	1	1	2	0	3	0	0	7
NORTH AMERICA	0	0	0	0	1	0	0	1
PANAMA	0	2	1	0	1	0	0	4
PARAGUAY	0	1	4	0	4	0	0	9
PERU	2	1	7	0	6	5	0	21
SURINAME	0	0	0	0	3	0	0	3
TRINADAD	1	0	0	0	0	0	0	1
VENEZUELA	0	3	3	2	12	0	0	20
TOTAL	15	26	55	10	106	10	0	222

** some taxa were assigned to more than one region

When *ex situ* management was recommended, the 'level' of captive program was also determined, reflecting status, prospects in the wild and taxonomic distinctiveness. The captive levels used during the CAMP workshop are defined below.

Level 1 (1) - A captive population is recommended as a component of a conservation program. This program has a tentative goal of developing and managing a population sufficient to preserve 90% of the genetic diversity of a population for 100 years (90%/100). The program should be further defined with a species management plan encompassing the wild and captive populations and implemented immediately with available stock in captivity. If the current stock is insufficient to meet program goals, a species management plan should be developed to specify the need for additional founder stock. If no stock is present in captivity then the program should be developed collaboratively with appropriate wildlife agencies, SSC Specialist Groups and cooperating institutions.

Level 2 (2) - Similar to the above, except a species/subspecies management plan would include periodic reinforcement of captive population with new genetic material from the wild. The levels and amount of genetic exchange needed should be defined in terms of the program goals, a population model and species management plan. It is anticipated that periodic supplementation with new genetic material will allow management of a smaller captive population. The time period for implementation of a Level 2 program will depend on recommendations made at the CAMP workshop.

Other captive recommendations include:

Level 3 (3) - A captive program is not currently recommended as a demographic or genetic contribution to the conservation of the species/subspecies, but is recommended for education, research or husbandry.

No (N) - A captive program is not currently recommended as a demographic or genetic contribution to the conservation of the species/subspecies. Taxa already held in captivity may be included in this category. In this case, species/subspecies should be evaluated either for management toward a decrease in numbers or for complete elimination from captive programs as part of a strategy to accommodate as many species/subspecies as possible of higher conservation priority as identified in the CAMP or in SSC Action Plans.

Pending (P) - A decision on a captive program will depend upon further data either from a Population and Habitat Viability Assessment (PHVA), a survey or existing identified sources to be queried.

Levels of Captive Programs Recommended for Cracid Taxa

All 116 cracid taxa were evaluated for possible inclusion in captive propagation programs based on data generated from the CAMP tables. The number of Cracid taxa in the wild by range country or region and by level of captive program recommended is shown in Table 3. Twenty-six (22%) taxa were recommended for a Level 1 program because of their precarious status in the wild, both in terms of extremely low population numbers and the quality and/or availabilty of suitable habitat. Ten taxa (9%) was identified as requiring a less intensive, Level 2, captive management program, and captive programs were recommended for 14 taxa for education, research or husbandry purposes. Sixteen taxa (14%) were classified as 'Pending' meaning that recommendations for these taxa would be postponed until further information was available. The remaining 25 taxa (22%) were not recommended for captive breeding because wild populations are stable, and there appears to be no immediate threat to habitat. Table 4 presents a summary of cracid taxa recommended for captive population by Draft IUCN Red List category of threat and type of captive program recommended. Table 5 presents the same information but only for taxa currently represented in captivity.

Table 3. Number of cracid taxa in the wild by range country or region and by level of captive management recommended.

REGION/ COUNTRY	TYPE OF CAPTIVE PROGRAM					TOTAL
	LEVEL 1	LEVEL 2	LEVEL 3	PENDING	NONE	
ARGENTINA	2	1	0	4	3	10
BELIZE	1	0	1	0	0	2
BOLIVIA	1	4	2	7	8	22
BRAZIL	17	0	14	0	2	33
COLOMBIA	6	1	0	7	21	35
COSTA RICA	0	2	1	0	0	3
DOMINICAN REPUBLIC	0	0	0	0	0	0
ECUADOR	3	1	0	2	9	15
EL SALVADOR	1	0	1	0	0	2
FRENCH GUIANA	0	0	0	0	4	4
GUATEMALA	3	0	2	0	0	5
GUYANA	0	0	0	0	0	0
HONDURAS	3	0	2	0	0	5
MEXICO	4	2	7	0	0	13
NICARAGUA	2	1	3	0	0	6
NORTH AMERICA	0	0	1	0	0	1
PANAMA	0	3	1	0	0	4
PARAGUAY	1	2	0	2	4	9
PERU	2	3	2	11	3	21
SURINAME	0	0	0	0	3	3
TRINADAD	1	0	0	0	0	1
VENEZUELA	2	1	0	3	14	20
TOTAL	49	21	37	36	77	220

** some taxa were assigned to more than one region

Table 4. Summary of cracid taxa recommended for captive populations by Draft IUCN Red List category of threat and type of captive population recommended.

DRAFT IUCN RED LIST	CAPTIVE POPULATION TYPES RECOMMENDED						TOTALS FOR LEVELS 1-3
	TAXA	LEVEL 1	LEVEL 2	LEVEL 3	PENDING	NONE	
CRITICAL	11	10	1	0	0	0	11
ENDANGERED	12	7	2	0	3	0	9
VULNERABLE	22	8	4	2	6	2	14
CONSERVATION DEPENDENT	7	0	2	0	1	4	2
LOW RISK	33	1	0	11	4	17	12
DATA DEFICIENT	2	0	0	0	0	2	0
EXTINCT IN THE WILD	1	1	0	0	0	0	1
NOT EVALUATED	0	0	0	0	0	0	0
TOTAL	88	27	9	13	14	25	49

Table 5. Summary of cracid taxa recommended for captive populations <u>and</u> <u>represented in captivity</u> by Draft IUCN Red List category of threat and type of captive population recommended.

DRAFT IUCN RED LIST	CAPTIVE POPULATION TYPES RECOMMENDED						TOTALS FOR LEVELS 1-3
	TAXA	LEVEL 1	LEVEL 2	LEVEL 3	PENDING	NONE	
CRITICAL	9	8	1	0	0	0	9
ENDANGERED	9	6	2	0	1	0	8
VULNERABLE	18	8	3	2	3	2	13
CONSERVATION DEPENDENT	3	0	2	0	0	1	2
LOW RISK	26	1	0	8	1	16	9
DATA DEFICIENT	1	0	0	0	0	1	0
EXTINCT IN THE WILD	1	1	0	0	0	0	1
NOT EVALUATED	0	0	0	0	0	0	0
TOTAL	67	24	8	10	5	20	42

The Cracid GCAR process involved (and will further involve in the future) considering all these relevant data in intensive and interactive discussion involving experts representing the various range countries of the birds and organized regions of the zoo world. The objectives are systematic decision-making, captive program prioritization, initial selection of global species target population sizes and identification of regional distribution of each taxon. This is followed by determining which species/subspecies and the estimated number of individual animals that should be included in captivity globally (target population size).

Determining Global Target Populations Using CAPACITY 3

The GCAR workshop participants considered all relevant data in intensive and interactive discussion. The objectives were systematic decision-making, captive program prioritization, initial selection of global species target population sizes and identification of regional distribution of each taxon. Second, a determination needed to be made about which species/subspecies, and how many individual animals of each, should be included in this global captive program. Target population sizes were computed using the program CAPACITY 3 (Ballou, 1992).

Using the CAPACITY program, global target population sizes were determined to achieve the captive program goals recommended for a particular taxon. The CAMP and GCAR processes attempt to achieve a goal of maintaining 90% of the program's original founder's heterozygosity for 100 years. Other program parameters that set and manipulated included:

1. generation length
2. annual growth rate of the population
3. size of the current captive population and effective population size
4. the estimated effective population size/total population size (Ne/N) ratio
5. percentage diversity retained to date
6. current year

General steps used for computing global target population numbers using Ballou's Capacity Program 3.0:

1. Calculate the N by assessing the total number of individuals in captivity.
2. Estimate the generation length by determining the median between the earliest age of reproduction and oldest age for reproduction, adjusting for decreasing reproduction with increasing age, if applicable.
3. Determine the crude lambda value which is the projected growth rate of the population under ideal conditions. If no better data are available, lambda can be estimated as the crude rate of change (CRC) found in the ISIS TAG report. When the CRC value is less than 1.0, it is necessary to artificially increase lambda to 1.1.
4. Determine the Ne as the number of living breeders (can be taken from the ISIS TAG report, unless more accurate data are available).
5. Calculate the Ne/N) by dividing the number of living breeders by the total number in captivity.

6. Consider 100% diversity at the onset of the program and the current year as 0 unless the population has been in captivity for a period of time and the loss of genetic diversity is known.
7. Using the above parameters, the target populations are computed for different program lengths (50, 100, 150, 200 years). All world target numbers are based on a 100 year management program with 90% retention of heterozygosity.
8. In some cases, it may be necessary to modify the variables of effective population size (i.e., the number of available animals may be too few to establish a viable program, and it will be necessary to plan to import new founders into the management program).
9. When more accurate information is available (from personal accounts or current international studbooks, for example), those data should be used in place of ISIS values.
10. It in imperative that all details involving the computation of global target populations are documented and included in the final GCAR report.

These steps were used to estimate global population size recommendations for each of the cracid species/subspecies recommended for captivity (Table 10). The specific assumptions made when calculating world target populations for Cracid taxa are as follows (** = Population is known to be highly inbred.):

Ortalis vetula vetula
N = 100
Generation Length = 12
Ne = 50
Lambda = 5
Ne/N ratio = 0.5
Projected population = 76
The current effective population of 50 birds is sufficient to start the project. With an Ne/N of 0.5 the total number in captivity must be 100 (N). The project can be started with current N.

Ortalis vetula deschauenseei
N = 0
Generation Length = 12
Ne = 10
Lambda = 5
Ne/N ratio = 0.5
Projected population = 132
This species has been recommended for a Level 1 captive program. To begin, with a viable population in captivity at least 20 birds is needed. The population in the wild is classified as critical, with less than 100 individuals thought to remain. At the moment no birds are available in captivity. It will not be possible to meet program goals unless several birds are removed from the wild. This can only be done if it is in conjunction with programs to study available suitable habitat and environmental education programs.

Ortalis vetula mccallii
N = 0
Generation Length = 12
Ne = 30
Lambda = 5
Ne/N **ratio** = 0.5
Projected population = 80
An effective population of 30 birds is needed to start the project. The total number currently in captivity (N) = 0. Therefore a minimum of 60 birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With >100,000 estimated in the wild, this appears feasible.

Ortalis vetula pallidiventris
N = 0
Generation Length = 12
Ne = 30
Lambda = 5
Ne/N ratio = 0.5
Projected population = 80
An effective population of 30 birds is needed to start the project. The total number currently in captivity (N) = 0. Therefore a minimum of 60 birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated 100,000 in the wild, this appears feasible.

Ortalis vetula intermedia
N = 0
Generation Length = 12
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 88
An effective population of 20 birds is needed to start the project. The total number currently in captivity (N) = 0. Therefore a minimum of 40 birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated 10,000-50,000 in the wild, this appears feasible.

Ortalis cinereiceps
N = 63**
Generation Length = 12
Ne = 30
Lambda = 5
Ne/N ratio = 0.5
Projected population = 80
In this program a genetically stable population of 80 birds needs to be maintained to achieve the program goals of maintenance of 90% genetic diversity for 100 years. The current population (N) of 63 would be enough birds to reach the desired effective population (Ne) of 30 birds if it were a genetically healthy population. Unfortunately that is not the case, therefore it is recommended to 1) bring additional, unrelated birds in from the wild, and 2) establish steps for maintaining their genetic diversity (studbook, etc.).

Ortalis poliocephala poliocephala
N = 30
Generation Length = 12
Ne = 15
Lambda = 5
Ne/N ratio = 0.5
Projected population = 98
An effective population of 15 birds is needed to start the project. With an Ne/N of 0.5 the total number in captivity has to be 30 (N). The project can be started with current N.

Ortalis poliocephala lajuelae
N = 11
Generation Length = 12
Ne = 30
Lambda = 5
Ne/N ratio = 0.5
Projected population = 80
An effective population of 20 birds is needed to start the project. The total number currently in captivity (N) = 0. Therefore a minimum of 40 birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With >100,000 estimated in the wild, this appears feasible.

Ortalis wagleri
N = 10 (total number currently in captivity)
Generation Length = 12
Ne = 20 (computed)
Lambda = 5 (under ideal conditions, 2 birds produce 8 chicks/year = 500% growth in population)
Ne/N ratio = 0.5
Projected population = 88
An effective population of 20 birds (n=40) is needed to start the project. Therefore a minimum of 30 birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated 200,000 in the wild, this appears feasible.

Ortalis leucogastra
N = 123
Generation Length = 12
Ne = 60
Lambda = 5
Ne/N ratio = 0.5
Projected population = 76
An effective population of 60 birds is needed to start the project. With an Ne/N of 0.5 the total number in captivity has to be 120. The project can be started with current N.

Ortalis erythroptera
N = 0
Generation Length = 12
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 88
An effective population of 20 birds is needed to start the project. The total number currently in captivity (N) = 0. Therefore a minimum of 40 birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated <5,000 in the wild, this appears feasible.

Ortalis canicollis panatanalensis
N = 20
Generation Length = 12
Ne = 20
Ne/N ratio = 0.5
Projected population = 88
An effective population of 20 birds is needed to start the project. Therefore, with an Ne/N of 0.5, a minimum of 20 additional birds have to be caught out of the wild and managed to

retain 90% genetic diversity for 100 years. With an estimated 100,000-200,000 in the wild, this appears feasible.

Ortalis guttata guttata
N = 18
Generation Length = 12
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 88
An effective population of 20 birds is needed to start the project. Therefore, with an Ne/N of 0.5, a minimum of 22 additional birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated 1,000,000 in the wild, this appears feasible.

Ortalis guttata araucuan
N = 45
Generation Length = 12
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 88
An effective population of 20 birds is needed to start the project. With an Ne/N of 0.5, the total number in captivity has to be 40 (N). The project can be started with current N.

Ortalis guttata squamata
N = 100
Generation Length = 12
Ne = 50
Lambda = 5
Ne/N ratio = 0.5
Projected population = 76
An effective population of 50 birds is needed to start the project. With an Ne/N of 0.5, the total number in captivity has to be 100 (N). The project can be started with current N.

Ortalis superciliaris superciliaris
N = 6
Generation Length = 12
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 88

This species has been recommended for a Level 1 captive program. To begin with, a viable population in captivity at least 20 birds are needed. The population in the wild is endangered, with 2,000-5,000 individuals thought to remain. At the moment no birds are available in captivity. It will not be possible to meet program goals unless 34 birds are removed from the wild. This can only be done if it is in conjunction with programs to study available suitable habitat and environmental education programs.

Ortalis motmot motmot
N = 30
Generation Length = 12
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 88
An effective population of 20 birds is needed to start the project. Therefore, with an Ne/N ratio of 0.5, a minimum of 10 additional birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated 100,000 in the wild, this appears feasible.

Ortalis motmot ruficeps
N = 17
Generation Length = 12
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 88
An effective population of 20 birds is needed to start the project. Therefore, with an Ne/N ration of 0.5, a minimum of 23 additional birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated 5,000-20,000 in the wild, this appears feasible.

Penelope purpurascens purpurascens
N = 622
Generation Length = 9
Ne = 75
Lambda = 5
Ne/N ratio = 0.5
Projected population = 104
With an Ne/N ratio of 0.5, a minimum of only approximately 150 birds are needed to achieve the program goals of 90%/100 years. A management program is needed to keep a genetically stable population while reducing the overall population, thereby making more space available for more critical species. *Penelope pupurascens purpurascens* could serve as a surrogate for

species such as *Peneleope albipenis*.

Penelope purpurascens aequatorialis
N = 51
Generation Length = 9
Ne = 25
Lambda = 5
Ne/N ratio = 0.5
Projected population = 118
An effective population of 25 birds is needed to start the project. With an Ne/N of 0.5 the total number in captivity has to be 50 (N). The project can be started with current N.

Penelope perspicax
N = 3
Generation Length = 9
Ne = 8
Lambda = 5
Ne/N ratio = 0.5
Projected population = 246
This species has been recommended for a Level 1 captive program. To begin with, a viable population in captivity at least 16 birds is needed. The population in the wild is classified as critical, with less than 1,000 individuals thought to remain. At the moment no birds are available in captivity. It will not be possible to meet program goals unless 13 birds are removed from the wild. This can only be done if it is in conjunction with programs to study available suitable habitat and environmental education programs.

Penelope albipenis
N = 60
Generation Length = 9
Ne = 16
Lambda = 5
Ne/N ratio = 5
Projected population = 227
The current captive population is housed at one location. Plans are underway to divide the population to avoid catastrophic loss. Effort should be made to develop no fewer than three locations. Once this is accomplished, the current program will be adequate to achieve the program goals without the need for additional breeding facilities outside Peru.

Penelope ortoni
N = 1
Generation Length = 9
Ne = 25
Lambda = 5
Ne/N ratio = 0.5
Projected population = 118
An effective population of 25 birds is needed to start the project. Therefore, with an Ne/N ration of 0.5, a minimum of 49 additional birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated population of 5,000-10,000 birds, this appears feasible.

Penelope marail jacupemba
N = 10
Generation Length = 9
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 126
An effective population of 20 birds is needed to start the project. Therefore, with and Ne/N ratio of 0.5, a minimum of 30 additional birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated population of 20,000-50,000 birds, this appears feasible.

Penelope jacquacu jacquacu
N = 42
Generation Length = 9
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 126
An effective population of 20 birds is needed to start the project. With an Ne/N of 0.5 the total number in captivity has to be 40 (N). The project can be started with current N.

Penelope jacquacu orienticola
N = 80
Generation Length = 9
Ne = 40
Lambda = 5
Ne/N ratio = 0.5
Projected population = 108
An effective population of 40 birds is needed to start the project. With an Ne/N of 0.5 the

total number in captivity has to be 80 (N). The project can be started with current N.

Penelope ochrogaster
N = 10
Generation Length = 9
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 126
This species has been recommended for a Level 1 captive program. To begin with, a viable population in captivity at least 16 birds are needed. The population in the wild is classified as vulnerable, with less than 2,000 individuals thought to remain. At the moment no birds are available in captivity. It will not be possible to meet program goals unless 30 birds are removed from the wild. This can only be done if it is in conjunction with programs to study available suitable habitat and environmental education programs.

Penelope pileata
N = 147
Generation Length = 9
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 126
An effective population of 20 birds is needed to start the project. With an Ne/N of 0.5 the total number in captivity has to be 40 (N). The project can be started with current N.

Penelope jacucaca
N = 254
Generation Length = 9
Ne = 127
Lambda = 5
Ne/N ratio = 0.5
Projected population = 104
The current effective population of 127 birds is sufficient to start the project. This species has been recommended for a Level 1 captive program. However, it is not known which subspecies of this species is in captivity. Only the nominant form is indicated. Before starting a program, studies must be done to be certain if all the birds belong to the same sub-species.
Question: are there sub-species of Penelope jacucaca?

Penelope supercilliaris supercilliaris
N = 31
Generation Length = 9
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 126
An effective population of 20 birds is needed to start the project. Therefore, with an Ne/N ratio of 0.5, a minimum of 9 additional birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years.

Penelope obscura obscura
N = 10
Generation Length = 9
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 126
An effective population of 20 birds is needed to start the project. Therefore, with an Ne/N ratio of 0.5 a minimum of 30 additional birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years.

Penelope obscura bronzina
N = 523
Generation Length = 9
Ne = 75
Lambda = 5
Ne/N ratio = 0.5
Projected population = 104
An effective population of 75 birds is needed to start the project. With an Ne/N of 0.5 the total number in captivity has to be 150 (N). The project can be started with current N.

Penelope argyrotis albicauda
N = 0
Generation Length = 9
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 126
An effective population of 20 birds is needed to start the project. The total number currently in captivity (N) = 0. Therefore a minimum of 40 birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated wild population of

<20,000 birds, this appears feasible.

Penelope barbata
N = 6
Generation Length = 9
Ne = 10
Lambda = 5
Ne/N ratio = 0.5
Projected population = 186
An effective population of 10 birds is needed to start the project. Because Ne/N ratio = 0.5, a minimum total population of 20 is required. Therefore, a minimum of 14 additional birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated wild population of <10,000 birds, this appears feasible.

Pipile pipile
N = 1
Generation Length = 9
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 126
This species has been recommended for a Level 1 captive program. To begin with, a viable population in captivity at least 40 birds are needed. The population in the wild is classified as critical, with less than 100 individuals thought to remain. At the moment only 1 bird is in captivity. It will not be possible to meet program goals unless 40 birds are removed from the wild. This can only be done if it is in conjunction with programs to study available suitable habitat and environmental education programs.

Pipile cumanensis cumanensis
N = 205**
Generation Length = 9
Ne = 30
Lambda = 5
Ne/N ratio = 0.5
Projected population = 114
An effective population of 30 birds is needed to start the project. With an Ne/N of 0.5 the total number in captivity has to be 60. The current population (N) of 205 would be enough birds to reach the desired effective population (Ne) of 100 birds if it were a genetically healthy population. Unfortunately that is not the case, therefore it is recommended to 1) bring additional, unrelated birds in from the wild, and 2) establish steps for maintaining their genetic diversity (studbook, etc.).

Pipile cumanensis grayi
N = 119**
Generation Length = 9
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 126
In this program we need to maintain a genetically stable population of 40 birds to achieve the program goals of maintenance of 90% genetic diversity for 100 years. The current population (N) of 119 would be enough birds to reach the desired effective population (Ne) of 20 birds if it were a genetically healthy population. Unfortunately that is not the case, therefore it is recommended to 1) bring additional, unrelated birds in from the wild (there are <5,000 birds remaining in the wild), and 2) establish steps for maintaining their genetic diversity (studbook, etc.).

Pipile cujubi cujubi
N = 10
Generation Length = 9
Ne = 20
Lambda = 5
Ne/N **ratio** = 0.5
Projected population = 126
An effective population of 20 birds is needed to start the project. Because Ne/N ratio = 0.5, birds minimum total population of 40 is required. Therefore, a minimum of 30 additional birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated wild population of <5,000 birds, this appears feasible.

Pipile jacutinga
N = 104
Generation Length = 9
Ne = 50
Lambda = 5
Ne/N ratio = 0.5
Projected population = 106
An effective population of 50 birds is needed to start the project. With an Ne/N of 0.5 the total number in captivity has to be 100 (N). The project can be started with current N.

Chamaepetes goudotti sanctamartha
N = 0
Generation Length = 9
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 126
An effective population of 20 birds is needed to start the project. Because Ne/N ratio = 0.5, birds minimum total population of 40 is required. Therefore, a minimum of 40 birds have to be caught out of the wild and managed to retain 90% genetic diversity for 100 years. With an estimated wild population of <5,000 birds, this appears feasible.

Chamaepetes unicolor
N = 15**
Generation Length = 9
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 126
In this program we need to maintain a genetically stable population of 40 birds to achieve the program goals of maintenance of 90% genetic diversity for 100 years. The current population (N) of 15 would not be enough birds to reach the desired effective population (Ne) of 20 birds. It is recommended to 1) bring additional, unrelated birds in from the wild (>25), and 2) establish steps for maintaining their genetic diversity (studbook, etc.).

Penelopina nigra
N = 67
Generation Length = 9
Ne = 30
Lambda = 5
Ne/N ratio = 0.5
Projected population = 104
An effective population of 33 birds is needed to start the project. The current total population consists of 67 individuals in Mesoamerica. Therefore, if the current captive population is genetically stable and managed cooperatively for maintenance of genetic diversity no additional birds need to be caught out of the wild at this time to reach the captive program goals.

Oreophasis derbianus
N = 48
Generation Length = 10
Ne = 24
Lambda = 5
Ne/N ratio = 0.5
Projected population = 108
An effective population of 24 birds is needed to start the project. The current total population consists of 48 individuals in Mesoamerica. Therefore, if the current captive population is genetically stable and managed cooperatively for maintenance of genetic diversity no additional birds need to be caught out of the wild at this time to reach the captive program goals.

Nothocrax urumutum
N = 121
Generation Length = 10
Ne = 60
Lambda = 5
Ne/N ratio = 0.5
Projected population = 96
The current effective population of 60 birds is sufficient to start the project. With an Ne/N of 0.5 the total number in captivity has to be 120 (N). The project can be started with current N.

Mitu mitu
N = 30
Generation Length = 10
Ne = 15
Lambda = 5
Ne/N ratio = 0.5
Projected population = 126
This species is extinct in the wild.

Mitu tuberosa
N = 302
Generation Length = 10
Ne = 150
Lambda = 5
Ne/N ratio = 0.5
Projected population = 96
The current effective population of 150 birds is sufficient to start the project. With an Ne/N of 0.5 the total number in captivity has to be 302. The project can be started with current N.

Mitu tomentosa
N = 114
Generation Length = 10
Ne = 57
Lambda = 5
Ne/N ratio = 0.5
Projected population = 96
The current effective population of 57 birds is sufficient to start the project. With an Ne/N of 0.5 the total number in captivity must be 114 (N). The project can be started with current N.

Pauxi pauxi pauxi
N = 511
Generation Length = 10
Ne = 250
Lambda = 5
Ne/N ratio = 0.5
Projected population = 96
The current effective population of 250 birds is sufficient to start the project. With an Ne/N of 0.5 the total number in captivity must be 500 (N). The project can be started with current N.

Pauxi gilliardi
N = 100
Generation Length = 10
Ne = 50
Lambda = 5
Ne/N ratio = 0.5
Projected population = 96
An effective population of 50 birds is needed to start the project. With an Ne/N of 0.5 the total number in captivity has to be 100 (N). The project can be started with current N.

Crax rubra rubra
N = 816
Generation Length = 10
Ne = 25
Lambda = 5
Ne/N ratio = 0.5
Projected population = 108
With an Ne/N ratio of 0.5, a minimum of only approximately 50 birds is needed to achieve the program goals of 90/100. A management program is needed to keep a genetically stable population, while reducing the overall population, thereby creating space for more endangered species (such as *Crax globulosa*).

Crax rubra griscomi
N = 0
Generation Length = 10
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 112
This species has been recommended for a Level 1 captive program. To begin with, a viable population in captivity at least 40 birds are needed. The population in the wild is classified as critical, with less than 50 individuals thought to remain. At the moment no birds are available in captivity. It will not be possible to meet program goals unless 40 birds are removed from the wild. This can only be done if it is in conjunction with programs to study available suitable habitat and environmental education programs.

Crax alberti
N = 32**
Generation Length = 10
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 112
This species has been recommended for a Level 1 captive program. To begin with a viable population in captivity at least 40 birds are needed. The population in the wild is endangered, with less than 2,500 individuals thought to remain. At the moment the available captive population is not genetically stable. It will not be possible to meet program goals unless 40 birds are removed from the wild. This can only be done if it is in conjunction with programs to study available suitable habitat and environmental education programs.

Crax alector alector
N = 281
Generation Length = 10
Ne = 50
Lambda = 5
Ne/N ratio = 0.5
Projected population = 96
With an Ne/N ratio of 0.5, a minimum of only approximately 100 birds is needed to achieve the program goals of 90/100. A management program is needed to keep a genetically stable population, while reducing the overall population, thereby creating space for more endangered species (such as *Crax globulosa*).

Crax fasciolata fasciolata
N = 528
Generation Length = 10
Ne = 50
Lambda = 5
Ne/N ratio = 0.5
Projected population = 96
With an Ne/N ratio of 0.5, a minimum of only approximately 100 birds is needed to achieve the program goals of 90/100. A management program is needed to keep a genetically stable population, while reducing the overall population, thereby creating space for more endangered species (such as *Crax globulosa*).

Crax fasciolata pinima
N = 17
Generation Length = 10
Ne = 20
Lambda = 5
Ne/N ratio = 0.5
Projected population = 112
This species has been recommended for a Level 1 captive program. To begin with, a viable captive population of at least 40 birds is needed. The population in the wild is classified as critical, with less than 1,000 individuals thought to remain. At the moment 17 birds are available in captivity. It will not be possible to meet program goals unless 13 birds are removed from the wild. This can only be done if it is in conjunction with programs to study available suitable habitat and environmental education programs.

Crax fasciolata grayi
N = 47
Generation Length = 10
Ne = 23
Lambda = 5
Ne/N ratio = 0.5
Projected population = 108
An effective population of 23 birds is needed to start the project. With an Ne/N of 0.5 the total number in captivity has to be 46 (N). The project can be started with current N.

Crax globulosa
N = 135**
Generation Length = 10
Ne = 30
Lambda = 5
Ne/N ratio = 0.3
Projected population = 170
An effective population of 60 birds is needed to start the project. The current total population consists of 135 individuals but there has been extensive inbreeding in captivity in both the European and North American populations and the European population is skewed with an excess of males. Nevertheless these populations consist of bloodlines not represented in captivity in Brazil. The current Brazilian population is genetically healthy. Therefore, it is recommended that genetic material be exchanged between populations in Europe/North America and Brazil, if the European/North American populations are to contribute to a conservation program for this species. If the captive population becomes genetically stable and is managed cooperatively for maintenance of genetic diversity no additional birds would need to be caught out of the wild at this time to reach the captive program goals.

Crax blumenbachii
N = 441
Generation Length = 10
Ne = 220
Lambda = 5
Ne/N ratio = 0.5
Projected population = 96
The current effective population of 220 birds is sufficient to start the project. With an Ne/N of 0.5 the total number in captivity has to be 440 (N). The project can be started with current N. Re-introduction programs already are started on this species.

Regional Responsibilities

The last step of the GCAR is for individual regions to begin to define specific interest in each recommended species/subspecies, information that later will drive regional responsibilities (i.e., the development of Regional Collection Plans) to preserve an overall viable world population. GCAR spreadsheets are constructed with columns for identification of regions currently holding the taxon and the number of specimens in captivity within that region (Table 10). Tables 6-9 present regional captive population information for 18 regions, countries or distinct populations.

Depending on the current captive population distribution and the global target recommendations for the taxon, regional populations targets can be set, or current targets revised, by each organized region of the zoo and aquarium community on the basis of global conservation need. For most of the Cracids, the global captive management goals set as a result of the GCAR process can be achieved within one country or region, specifically the country or region of origin for that particular species or subspecies.

Table 6. Current numbers of cracid taxa in regional captive populations by Draft IUCN Red List category of threat.

REGION/ COUNTRY	DRAFT IUCN RED LIST CATEGORY								TOTAL
	CRITICAL	ENDANG	VULNER	CONSERV DEPENDENT	LOW RISK	DATA DEFICIENT	EXTINCT IN WILD	NOT EVALUATED	
ARGENTINA	0	0	1	1	2	0	0	0	4
AUSTRAL-ASIA	0	0	0	0	1	0	0	0	1
BOLIVIA	1	0	1	1	2	0	0	0	5
BRAZIL	4	2	10	0	12	0	1	0	29
COLOMBIA	3	2	2	1	1	0	0	0	9
COSTA RICA	0	1	1	0	0	0	0	0	2
DOMINICAN REPUBLIC	0	1	0	0	0	0	0	0	1
ESTUDILLO	6	7	7	2	9	1	0	0	32
EUROPE	2	3	6	1	10	1	0	0	23
GUATEMALA	1	2	1	0	3	0	0	0	7
ISRAEL	0	1	0	0	0	0	0	0	1
JAPAN	1	1	0	0	0	0	0	0	2
MESO-AMERICA	0	1	1	0	0	0	0	0	2
MEXICO	1	3	2	0	4	0	0	0	10
NORTH AMERICA	1	3	3	0	5	0	0	0	12
PERU	1	0	0	0	0	0	0	0	1
SOUTH AMERICA	1	0	2	0	0	0	0	0	3
VENEZUELA	1	3	3	1	7	0	0	0	15
TOTAL	23	30	40	7	56	2	1	0	159

Table 7. Current numbers of cracid specimens in regional captive populations by Draft IUCN Red List category of threat.

REGION/ COUNTRY	DRAFT IUCN RED LIST CATEGORY								Total
	CRITICAL	ENDANG	VULNER	CONSERV DEPENDENT	LOW RISK	DATA DEFICIENT	EXTINCT IN WILD	NOT EVALUATED	
ARGENTINA	0	0	10	4	10	0	0	0	24
AUSTRAL-ASIA	0	0	0	0	5	0	0	0	5
BOLIVIA	50	0	2	2	8	0	0	0	62
BRAZIL	513	60	1306	0	461	0	30	0	2370
COLOMBIA	4	3	3	1	1	0	0	0	12
COSTA RICA	0	1	7	0	0	0	0	0	8
DOMINICAN REPUBLIC	0	7	0	0	0	0	0	0	7
ESTUDILLO	263	1053	527	57	362	6	0	0	2268
EUROPE	34	187	177	2	564	4	0	0	968
GUATEMALA	8	67	50	0	208	0	0	0	333
ISRAEL	0	5	0	0	0	0	0	0	5
JAPAN	4	9	0	0	0	0	0	0	13
MESO-AMERICA	0	43	50	0	0	0	0	0	93
MEXICO	1	14	12	0	94	0	0	0	121
NORTH AMERICA	14	222	65	0	219	0	0	0	520
PERU	60	0	0	0	0	0	0	0	60
SOUTH AMERICA	3	0	12	0	0	0	0	0	15
VENEZUELA	2	14	25	3	56	0	0	0	100
TOTAL	956	1685	2248	69	1988	10	30	0	6984

Table 8. Current numbers of cracid taxa in regional captive populations by level of captive management recommended.

REGION/ COUNTRY	TYPE OF CAPTIVE PROGRAM					TOTAL
	LEVEL 1	LEVEL 2	LEVEL 3	PENDING	NO PROG	
ARGENTINA	0	1	0	1	2	4
AUSTRALASIA	0	0	0	0	1	1
BOLIVIA	2	1	1	0	1	5
BRAZIL	14	1	5	0	9	29
COLOMBIA	5	1	0	0	3	9
COSTA RICA	0	1	1	0	0	2
DOMINICAN REPUBLIC	0	1	0	0	0	1
ESTUDILLO	14	4	3	2	9	32
EUROPE	7	1	3	1	11	23
GUATEMALA	3	1	3	0	0	7
ISRAEL	0	1	0	0	0	1
JAPAN	1	1	0	0	0	2
MESOAMERICA	1	1	0	0	0	2
MEXICO	3	2	4	0	1	10
NORTH AMERICA	4	2	1	0	5	12
PERU	0	1	0	0	0	1
SOUTH AMERICA	1	0	0	2	0	3
VENEZUELA	2	2	0	2	9	15
TOTAL	57	22	21	8	51	159

Table 9. Current numbers of cracid specimens in regional captive populations by level of captive management recommended.

REGION/ COUNTRY	TYPE OF CAPTIVE PROGRAM					TOTAL
	LEVEL 1	LEVEL 2	LEVEL 3	PENDING	NO PROG	
ARGENTINA	0	10	0	2	12	24
AUSTRALASIA	0	0	0	0	5	5
BOLIVIA	52	2	4	0	4	62
BRAZIL	1299	500	150	0	421	2370
COLOMBIA	7	1	0	0	4	12
COSTA RICA	0	1	7	0	0	8
DOMINICAN REPUBLIC	0	7	0	0	0	7
ESTUDILLO	1263	570	105	90	240	2268
EUROPE	200	98	148	6	516	968
GUATEMALA	75	50	208	0	0	333
ISRAEL	0	5	0	0	0	5
JAPAN	0	13	0	0	0	13
MESOAMERICA	43	50	0	0	0	93
MEXICO	14	11	94	0	2	121
NORTH AMERICA	117	151	25	0	227	520
PERU	0	60	0	0	0	60
SOUTH AMERICA	3	0	0	12	0	15
VENEZUELA	9	3	0	6	82	100
TOTAL	3082	1532	741	116	1513	6984

This working draft of Cracid GCAR will be distributed by the CBSG to all participants and to TAG chairs and Species Conservation Coordinators. The intent is to facilitate regional interaction to optimize the use of captive space and resources for international conservation. It should be re-emphasized that the GCAR document is a "living" set of guidelines, meaning that it will be reassessed and revised continually based upon new information and shifting needs.

CRACID
GLOBAL CAPTIVE ACTION RECOMMENDATIONS

WORKING DOCUMENT

December 1995

Report from the workshop held
1-3 October 1994

Edited and Compiled by
Luud Geerlings, Alan Rost, Chelle Plasse, Dave Thompson, Stuart Strahl, Onnie Byers

SECTION 2

GCAR SPREADSHEET CATEGORY DEFINITIONS AND SPREADSHEET

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SECTION 2

GCAR SPREADSHEET CATEGORY DEFINITIONS
AND SPREADSHEET

GLOBAL CAPTIVE ACTION RECOMMENDATIONS (GCAR) SPREADSHEET CATEGORIES

The Global Captive Action Recommendations (GCAR) spreadsheet is a working document that provides information to be used for assessing degree of threat and recommending conservation action. The first section of the spreadsheet summarizes information (usually gathered during the Conservation Assessment and Management Plan, CAMP, Workshop) on wild population status and level of captive program recommended for each taxon. This information can be used to identify priorities for captive management action.

TAXON

SCIENTIFIC NAME: Scientific names of extant taxa: genus, species, subspecies.

WILD POPULATION

EST #: Estimated numbers of individuals in the wild. If specific numbers are unavailable, general range of the population size is estimated.

IUCN: Status according to draft IUCN Red List criteria (see explanation, pg.5)

- **EX = Extinct**
- **EW = Extinct in the Wild**
- **CR = Critical**
- **EN = Endangered**
- **VU = Vulnerable**
- **CD = Conservation Dependent**
- **SU = Susceptible**
- **LR = Low Risk**
- **DD = Data Deficient**
- **NE = Not Evaluated**

CAPTIVE PROGRAM RECOMMENDATIONS

Recommendation:	Level of Captive Program:
Level 1 (1)	A captive population is recommended as a component of a conservation program. This program has a tentative goal of developing and managing a population sufficient to preserve 90% of the genetic diversity of a population for 100 years (90%/100). The program is further defined with a species management plan encompassing the wild and captive populations and implemented immediately with available stock in captivity. If the current stock is insufficient to meet program goals, a species management plan should be developed to specify the need for additional founder stock.If no stock is present in captivity, then

the program should be developed collaboratively with appropriate wildlife agencies, SSC Specialist Groups and cooperating institutions.

Level 2 (2)
Similar to 'Level 1' except a species/subspecies management plan includes periodic reinforcement of the captive population with new genetic material from the wild. The levels and amount of genetic exchange needed should be defined in terms of the program goals, a population model and species management plan. It is anticipated that periodic supplementation with new genetic material will allow management of a smaller captive population. The time period for implementation of a Level 2 program will depend on recommendations made at the CAMP workshop.

No (N)
A captive program is not currently recommended as a demographic or genetic contribution to the conservation of the species or subspecies. Taxa already held in captivity may be included in this category. In this case, species/subspecies shouldbe evaluated either for management toward a decrease in numbers or for complete elimination from captive programs. This will assist in accommodating more species/subspecies of higher conservation priority (as identified in the CAMP or in SSC Action Plans).

Pending (P)
A decision on a captive program will depend upon further data either from a PHVA, a survey or existing identified sources to be queried.

WORLD

The information entered into this section of the GCAR spreadsheet defines the current global captive population and will be used to calculate target populations for each taxon recommended for captive management.

N: Size of the current captive population
Gen Lgth: Generation length
Ne: Effective population size
Lambda: Annual growth rate of the population
Trg Pop: Target population size computed using Ballou's CAPACITY program. This is the proposed number of individuals that must be maintained in captivity to achieve the level of captive program recommended for that taxon.

DISTRIBUTION OF CAPTIVE POPULATION

Loc: Location of a captive population of a particular taxon. This can be one of the organized regions of the zoo and aquarium world, a region not represented by a formal zoo association or a specific country holding that taxon.

Pop: The number of individuals of a particular taxon currently maintained in the specified region.

Table 10. GLOBAL CAPTIVE ACTION RECOMMENDATIONS FOR CRACIDS

	TAXON		CAMP DATA				WORLD					DISTRIBUTION OF CAPTIVE POPULATION																	
	SCIENTIFIC NAME		WILD EST#	NEW IUCN	CAP REC	DIF	N	Gen Lgth	Ne	Lamb da	Trg Pop	Meso amer.*	S.Amer*	Mex	Peru	Guat	Ven	Braz	Bol	Arg	Col	Estu dillo	Israel	Dom.R ep.	Costa Rica	N.Amer	Eur	Aust./ N.Z.	Japan
												Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop
	Cracidae																												
1	Ortalis	vetula (unknown subspecies)					>119															>40				79			
2	Ortalis	vetula vetula	>100,000	LR	3	1	100	12	50	5	76					100													
3	Ortalis	vetula deschauenseei	<100	CR	1	1	0	12	10	5	132																		
4	Ortalis	vetula mccallii	>100,000 (20,000 in Texas)	LR	3	1	0	12	30	5	80																		
5	Ortalis	vetula pallidiventris	>100,000	LR	3	1	0	12	30	5	80																		
6	Ortalis	vetula intermedia	10,000-50,000	LR	3	1	0	12	20	5	88																		
7	Ortalis	garrula (unknown subspecies)					3										3												
8	Ortalis	garrula garrula	>10,000	LR?	P	1	0																						
9	Ortalis	cinereiceps	>100,000	LR?	3/NO	1	>63**	12	30	5	80			>30		8										25			
10	Ortalis	poliocephala																											
11	Ortalis	poliocephala poliocephala	>100,000	LR	3	1	30	12	15	5	98			30															
12	Ortalis	poliocephala lajuelae	>100,000	LR	3	1	11+/-1	12	30	5	80			11+/-1															
13	Ortalis	wagleri	<200,000	VU?	2	1	~10	12	20	5	88			~10															
14	Ortalis	leucogastra	>10,000	LR	3	1	123	12	60	5	76			23		100													

	TAXON		CAMP DATA				WORLD					DISTRIBUTION OF CAPTIVE POPULATION																	
	SCIENTIFIC NAME		WILD EST#	NEW IUCN	CAP REC	DIF	N	Gen Lgth	Ne	Lamb da	Trg Pop	Meso amer.*	S.Amer*	Mex	Peru	Guat	Ven	Braz	Bol	Arg	Col	Estu dillo	Israel	Dom.R ep.	Costa Rica	N.Amer	Eur	Aust./ N.Z.	Japan
												Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop
15	Ortalis	ruficauda (unknown subspecies)					42															10					32		
16	Ortalis	ruficauda ruficauda	>100,000	LR	No	1	38										38												
17	Ortalis	ruficauda ruficrissa	?	LR?	No	1	1										1												
18	Ortalis	ruficauda lamprophonia	?	DD	No	1	0																						
19	Ortalis	erythroptera	<5,000	EN	1	2/1	0	12	20	5	88																		
20	Ortalis	canicollis (unknown subspecies)					186+/-5						>100									15+/-5					71		
21	Ortalis	canicollis canicollis	>100,000	LR	N	1	0																						
22	Ortalis	canicollis panatanalensis	100,000-200,000	LR	3/N	1	<20	12	20	5	88							<20											
23	Ortalis	guttata (unknown subspecies)	1				13										12									1			
24	Ortalis	guttata guttata	>1,000,000	LR	N/3	1	<18	12	20	5	88							<10		8									
25	Ortalis	guttata subaffinis	>50,000	LR	N	1	0																						
26	Ortalis	guttata araucuan	2,000-5,000	VU	1	1	<45	12	20	5	88							<30				6					9		
27	Ortalis	guttata squamata	<2,000	VU	1	1	<100	12	50	5	76							<100											
28	Ortalis	guttata columbiana	?	DD	No	1	10															6					4		

	TAXON		CAMP DATA				WORLD					DISTRIBUTION OF CAPTIVE POPULATION																	
	SCIENTIFIC NAME		WILD EST#	NEW IUCN	CAP REC	DIF	N	Gen Lgth	Ne	Lamb da	Trg Pop	Meso amer.*	S.Amer*	Mex	Peru	Guat	Ven	Braz	Bol	Arg	Col	Estu dillo	Israel	Dom.Rep.	Costa Rica	N.Amer	Eur	Aust./N.Z.	Japan
												Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop
29	Ortalis	superciliaris (unknown subspecies)					<22											<20									2		
30	Ortalis	superciliaris superciliaris	2,000-5,000	VU	1	1	6	12	20	5	88											6							
31	Ortalis	motmot (unknown subspecies)					8															8							
32	Ortalis	motmot motmot	>100,000	LR	N/3	1	30	12	20	5	88						1										29		
33	Ortalis	motmot ruficeps	5,000-20,000	VU	3	1	<17	12	20	5	88							<10							7				
34	Penelope	purpurascens (unknown subspecies)					7																		7				
35	Penelope	purpurascens purpurascens	<50,000	VU	1	1	622+/-50	9	75	5	104					50		31				450+/-50				24	67		
36	Penelope	purpurascens aequatorialis	>70,000	VU/LR	2/No	1	>51	9	25	5	118	>50									1								
37	Penelope	purpurascens brunnescen-	?	VU	P	1	6																				6		
38	Penelope	perspicax	<1,000	CR	1	2	3	9	8	5	246						2				1								
39	Penelope	albipennis	+/-350	CR	2	2	60	9	16	5	227				60														
40	Penelope	ortoni	5,000-10,000	VU	2	1	1	9	25	5	118						1												
41	Penelope	marail (unknown subspecies)					51															4					47		
42	Penelope	marail marail	>100,000	LR	N	1	0																						
43	Penelope	marail jacupemba	20,000-50,000	LR	No/3	1	<10	9	20	5	126							<10											

	TAXON		CAMP DATA				WORLD					DISTRIBUTION OF CAPTIVE POPULATION																	
	SCIENTIFIC NAME		WILD EST#	NEW IUCN	CAP REC	DIF	N	Gen Lgth	Ne	Lamb da	Trg Pop	Meso amer.*	S.Amer*	Mex	Peru	Guat	Ven	Braz	Bol	Arg	Col	Estu dillo	Israel	Dom.R ep.	Costa Rica	N.Amer	Eur	Aust./ N.Z.	Japan
												Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop
44	Penelope	jacquacu					18								1											17			
45	Penelope	jacquacu juaquacu	>500,000	LR	No/3	1/2	<42	9	20	5	126							<10									32		
46	Penelope	jacquacu orienticola	>200,000	LR	No/3	1/2	80											<10				<70							
47	Penelope	jacquacu granti	>50,000	LR	N	2	132										9					70					53		
48	Penelope	jacquacu speciosa	>10,000	LR	P	1	72													2		70							
49	Penelope	ochrogaster	<2,000	VU	1	2	<10	9	20	5	126							<10											
50	Penelope	pileata	5,000-10,000	VU	3	2	<147	9	20	5	126							<96 (+4 zoo)				5					42		
51	Penelope	dabbenei	10,000?	VU	P	1	0																						
52	Penelope	jacucaca (unknown subspecies)	500-1,000	CR	1	2	<254	9	12 7	5	104								<50			200							
53	Penelope	jacucaca granti					0																						
54	Penelope	jacucaca jacucaca					0																						
55	Penelope	superciliaris (unknown subspecies)					<320											<28 9 (11 zoo)				20							
56	Penelope	superciliaris superciliaris	>100,000	LR	3	1	31	9	20	5	126																31		
57	Penelope	superciliaris jacupemba	+/-5,000	CD	2	1	6	9	10	5	278									4							2		
58	Penelope	superciliaris major	>10,000	VU?	P	1	10						10																
59	Penelope	obscura					0																						

	TAXON		CAMP DATA				WORLD					DISTRIBUTION OF CAPTIVE POPULATION																	
	SCIENTIFIC NAME		WILD EST#	NEW IUCN	CAP REC	DIF	N	Gen Lgth	Ne	Lamb da	Trg Pop	Meso amer.*	S.Amer*	Mex	Peru	Guat	Ven	Braz	Bol	Arg	Col	Estu dillo	Israel	Dom.R ep.	Costa Rica	N.Amer	Eur	Aust./ N.Z.	Japan
												Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop
60	Penelope	obscura obscura	<4,000	EN/VU	1/P	2/1	<10	9	20	5	126							<10											
61	Penelope	obscura bridgesi	>100,000	LR	N	1	20															20							
62	Penelope	obscura bronzina	5,000-10,000	VU	1	1	<523	9	75	5	104							<50 0	2			20					1		
63	Penelope	argyrotis (unknown subspecies)					24																				24		
64	Penelope	argyrotis argyrotis	<50,000	CD	N	1	16										3				1	12							
65	Penelope	argyrotis albicauda	<20,000	VU	2	1	0	9	20	5	126																		
66	Penelope	argyrotis colombiana	<10,000	EN	P	1	0																						
67	Penelope	barbata	<10,000	EN/VU	1/P	1	6	9	10	5	186											6							
68	Penelope	montagnii (unknown subspecies)					50															23					27		
69	Penelope	montagnii montagnii	5,000-10,000	CD	P	1	0																						
70	Penelope	montagnii atrogularis	<5,000	VU	N	1	1										1												
71	Penelope	montagnii brooki	>5,000	CD	N	1	0																						
72	Penelope	montagnii plumosa	?	LR	P	1?	0																						
73	Penelope	montagnii sclateri	?	LR	P	1?	0																						
74	Pipile	pipile	<100	CR	1	1	1	9	20	5	126										1								

	TAXON		CAMP DATA				WORLD					DISTRIBUTION OF CAPTIVE POPULATION																	
	SCIENTIFIC NAME		WILD EST#	NEW IUCN	CAP REC	DIF	N	Gen Lgth	Ne	Lamb da	Trg Pop	Meso amer.*	S.Amer*	Mex	Peru	Guat	Ven	Braz	Bol	Arg	Col	Estu dillo	Israel	Dom.R ep.	Costa Rica	N.Amer	Eur	Aust./ N.Z.	Japan
												Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop
75	Pipile	cumanensis					0																						
76	Pipile	cumanensis cumanensis	>100,000	LR/VU ?	No/3	1/2	<205	9	30	5	114						1	<31								69**	104		
77	Pipile	cumanensis grayi	<15,000	LR/VU ?	3/No	2/1	<119	9	20	5	126							<10	4			30					75		
78	Pipile	cujubi (unknown subspecies)					4															4							
79	Pipile	cujubi cujubi	<5,000	VU	1	2	<10	9	20	5	126							<5 (+5 zoo)											
80	Pipile	cujubi natterei	10,000 - 20,000	VU/EN	1/P	2/1	<15											<15											
81	Pipile	jacutinga	>1,000 - 2,000	CR/EN	1	2/1?	<104	9	50	5	106							<100				4							
82	Aburria	aburri	<10,000	EN/VU	P	1/2	25										5					20							
83	Chamaepetes	goudotii (unknown subspecies)					18+/-1														7	11+/-1							
84	Chamaepetes	goudotii goudotii	>100,000	LR/DD	N/P	1/2?	5										5												
85	Chamaepetes	goudotii sanctaemarthae	<5,000	VU	1	1/2	0	9	20	5	126																		
86	Chamaepetes	goudotii fagani	>5,000	CD	No	1/2	0																						
87	Chamaepetes	goudotii tschudii	>5,000	CD/ DD	No/P	1/2	0																						
88	Chamaepetes	goudotii rufiventris	10,000?	VU?	P	1?	0																						
89	Chamaepetes	unicolor	<2,000	EN	2	3	15**	9	20	5	126											15							

	TAXON		CAMP DATA				WORLD					DISTRIBUTION OF CAPTIVE POPULATION																	
	SCIENTIFIC NAME		WILD EST#	NEW IUCN	CAP REC	DIF	N	Gen Lgth	Ne	Lamb da	Trg Pop	Meso amer.*	S.Amer*	Mex	Peru	Guat	Ven	Braz	Bol	Arg	Col	Estu dillo	Israel	Dom.R ep.	Costa Rica	N.Amer	Eur	Aust./ N.Z.	Japan
												Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop
90	Penelopina	nigra	<5,000	EN	1	2	67	9	30	5	104	43		7		17													
91	Oreophasis	derbianus	<1,000	CR	1	1	>48	10	24	5	108			>1		8						39							
92	Nothocrax	urumutum	>50,000	LR	N/2/ 3?	1/2	<121	10	60	5	96							<54 (+6 zoo)				20					41		
93	Mitu	mitu	0	EW	1	2	30	10	15	5	126							30											
94	Mitu	tuberosa	>100,000	LR	N/2/ 3	1/2	<302	10	24	5	108							<15 0	4			10				35	98	5	
95	Mitu	salvini	>50,000	VU	P	1	0																						
96	Mitu	tomentosa	>100,000	LR	N/3	1/2	<114**	10	57	5	96						1	<30			1	>60				17	5		
97	Pauxi	pauxi					0																						
98	Pauxi	pauxi pauxi	<2,000	EN	1	1	511	10	25 0	5	96			6			7				2	400				34	62		
99	Pauxi	pauxi gilliardi	<1,000	EN	1	1	100	10	50	5	96											100							
100	Pauxi	unicornis					18**															18							
101	Pauxi	unicornis unicornis	<5,000	VU	P	1	2						2																
102	Pauxi	unicornis koepckeae	<2,500	EN	P	1?	0																						
103	Crax	rubra					0																						
104	Crax	rubra rubra	5,000	EN/ VU	2/P	2/1	>816	10	25	5	108			>1		50	2					500	5	7	1	143	98		9
105	Crax	rubra griscomi	<50	CR	1	1	0	10	20	5	112																		
106	Crax	alberti	1,000-2500	CR	1	1	32**	10	20	5	112							3			2	6				14	3		4

	TAXON		CAMP DATA				WORLD					DISTRIBUTION OF CAPTIVE POPULATION																	
	SCIENTIFIC NAME		WILD EST#	NEW IUCN	CAP REC	DIF	N	Gen Lgth	Ne	Lamb da	Trg Pop	Meso amer.*	S.Amer*	Mex	Peru	Guat	Ven	Braz	Bol	Arg	Col	Estu dillo	Israel	Dom.R ep.	Costa Rica	N.Amer	Eur	Aust./ N.Z.	Japan
												Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop	Pop
107	Crax	alector (unknown subspecies)					4										2												2
108	Crax	alector alector	>100,000	LR	No/3	1/2	<281	10	50	5	96							<10 0				12				73	96		
109	Crax	alector erythrognatha	>100,000	LR	No	1	<20											<20											
110	Crax	daubentoni	10,000 - 40,000	VU	No	1	142							2			23				2	30				33	52		
111	Crax	fasciolata (unknown subspecies)					187**																			34	145		8
112	Crax	fasciolata fasciolata	<50,000	LR/VU ?	1/2	1	<528	10	50	5	96							<50 0		10		10				8			
113	Crax	fasciolata pinima	<1,000	CR	1	2	<17	10	20	5	112		3					<10				4							
114	Crax	fasciolata grayi	>5,000	CD	2	1	47+/-5	10	23	5	108								2			45 +/-5							
115	Crax	globulosa	<7,500	EN/CR /VU	1	1/2	<135**	10	30	5	170							<50			1	12				45	27		
116	Crax	blumenbachii	<300	CR	1	1	<441	10	22 0	5	96							<38 8 (+12 zoo)				10					31		

* Country unspecified
** Population is known to be highly inbred

CRACID
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SECTION 4

REFERENCE MATERIALS

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SECTION 4

REFERENCE MATERIALS

IUCN RED LIST CATEGORIES

Prepared by the

IUCN Species Survival Commission

As approved by the
40th Meeting of the IUCN Council
Gland, Switzerland

30 November 1994

IUCN RED LIST CATEGORIES

I) Introduction

1. The threatened species categories now used in Red Data Books and Red Lists have been in place, with some modification, for almost 30 years. Since their introduction these categories have become widely recognised internationally, and they are now used in a whole range of publications and listings, produced by IUCN as well as by numerous governmental and non-governmental organisations. The Red Data Book categories provide an easily and widely understood method for highlighting those species under higher extinction risk, so as to focus attention on conservation measures designed to protect them.

2. The need to revise the categories has been recognised for some time. In 1984, the SSC held a symposium, 'The Road to Extinction' (Fitter & Fitter 1987), which examined the issues in some detail, and at which a number of options were considered for the revised system. However, no single proposal resulted. The current phase of development began in 1989 with a request from the SSC Steering Committee to develop a new approach that would provide the conservation community with useful information for action planning.

In this document, proposals for new definitions for Red List categories are presented. The general aim of the new system is to provide an explicit, objective framework for the classification of species according to their extinction risk.

The revision has several specific aims:

- to provide a system that can be applied consistently by different people;
- to improve the objectivity by providing those using the criteria with clear guidance on how to evaluate different factors which affect risk of extinction;
- to provide a system which will facilitate comparisons across widely different taxa;
- to give people using threatened species lists a better understanding of how individual species were classified.

3. The proposals presented in this document result from a continuing process of drafting, consultation and validation. It was clear that the production of a large number of draft proposals led to some confusion, especially as each draft has been used for classifying some set of species for conservation purposes. To clarify matters, and to open the way for modifications as and when they became necessary, a system for version numbering was applied as follows:

Version 1.0: Mace & Lande (1991)
The first paper discussing a new basis for the categories, and presenting numerical criteria especially relevant for large vertebrates.

Version 2.0: Mace _et al_. (1992)
A major revision of Version 1.0, including numerical criteria appropriate to all organisms and introducing the non-threatened categories.

Version 2.1: IUCN (1993)

Following an extensive consultation process within SSC, a number of changes were made to the details of the criteria, and fuller explanation of basic principles was included. A more explicit structure clarified the significance of the non-threatened categories.

Version 2.2: Mace & Stuart (1994)

Following further comments received and additional validation exercises, some minor changes to the criteria were made. In addition, the Susceptible category present in Versions 2.0 and 2.1 was subsumed into the Vulnerable category. A precautionary application of the system was emphasised.

Final Version

This final document, which incorporates changes as a result of comments from IUCN members, was adopted by the IUCN Council in December 1994.

All future taxon lists including categorisations should be based on this version, and not the previous ones.

4. In the rest of this document the proposed system is outlined in several sections. The Preamble presents some basic information about the context and structure of the proposal, and the procedures that are to be followed in applying the definitions to species. This is followed by a section giving definitions of terms used. Finally the definitions are presented, followed by the quantitative criteria used for classification within the threatened categories. It is important for the effective functioning of the new system that all sections are read and understood, and the guidelines followed.

References:

Fitter, R., and M. Fitter, ed. (1987) The Road to Extinction. Gland, Switzerland: IUCN.

IUCN. (1993) Draft IUCN Red List Categories. Gland, Switzerland: IUCN.

Mace, G. M. et al. (1992) "The development of new criteria for listing species on the IUCN Red List." Species 19: 16-22.

Mace, G. M., and R. Lande. (1991) "Assessing extinction threats: toward a reevaluation of IUCN threatened species categories." Conserv. Biol. 5.2: 148-157.

Mace, G. M. & S. N. Stuart. (1994) "Draft IUCN Red List Categories, Version 2.2". Species 21-22: 13-24.

II) Preamble

The following points present important information on the use and interpretation of the categories (= Critically Endangered, Endangered, etc.), criteria (= A to E), and sub-criteria (= a,b etc., i,ii etc.):

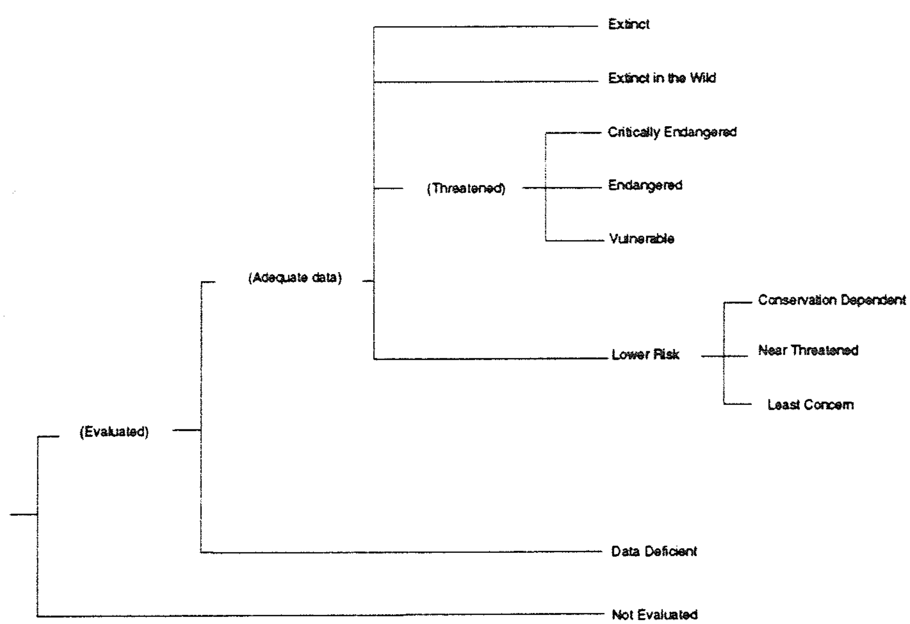
1. Taxonomic level and scope of the categorisation process

The criteria can be applied to any taxonomic unit at or below the species level. The term 'taxon' in the following notes, definitions and criteria is used for convenience, and may represent species or lower taxonomic levels, including forms that are not yet formally described. There is a sufficient range among the different criteria to enable the appropriate listing of taxa from the complete taxonomic spectrum, with the exception of micro-organisms. The criteria may also be applied within any specified geographical or political area although in such cases special notice should be taken of point 11 below. In presenting the results of applying the criteria, the taxonomic unit and area under consideration should be made explicit. The categorisation process should only be applied to wild populations inside their natural range, and to populations resulting from benign introductions (defined in the draft IUCN Guidelines for Re-introductions as "..an attempt to establish a species, for the purpose of conservation, outside its recorded distribution, but within an appropriate habitat and eco-geographical area").

2. Nature of the categories

All taxa listed as Critically Endangered qualify for Vulnerable and Endangered, and all listed as Endangered qualify for Vulnerable. Together these categories are described as 'threatened'. The threatened species categories form a part of the overall scheme. It will be possible to place all taxa into one of the categories (see Figure 1).

Figure 1: Structure of the Categories



3. **Role of the different criteria**

For listing as Critically Endangered, Endangered or Vulnerable there is a range of quantitative criteria; meeting any one of these criteria qualifies a taxon for listing at that level of threat. Each species should be evaluated against all the criteria. The different criteria (A-E) are derived from a wide review aimed at detecting risk factors across the broad range of organisms and the diverse life histories they exhibit. Even though some criteria will be inappropriate for certain taxa(some taxa will never qualify under these however close to extinction they come), there should be criteria appropriate for assessing threat levels for any taxon (other than micro-organisms). The relevant factor is whether any one criterion is met, not whether all are appropriate or all are met. Because it will never be clear which criteria are appropriate for a particular species in advance, each species should be evaluated against all the criteria, and any criterion met should be listed.

4. **Derivation of quantitative criteria**

The quantitative values presented in the various criteria associated with threatened categories were developed through wide consultation and they are set at what are generally judged to be appropriate levels, even if no formal justification for these values exists. The levels for different criteria within categories were set independently but against a common standard. Some broad consistency between them was sought. However, a given taxon should not be expected to meet all criteria (A-E) in a category; meeting any one criterion is sufficient for listing.

5. **Implications of listing**

Listing in the categories of Not Evaluated and Data Deficient indicates that no assessment of extinction risk has been made, though for different reasons. Until such time as an assessment is made, species listed in these categories should not be treated as if they were non-threatened, and it may be appropriate (especially for Data Deficient forms) to give them the same degree of protection as threatened taxa, at least until their status can be evaluated.

Extinction is assumed here to be a chance process. Thus, a listing in a higher extinction risk category implies a higher expectation of extinction, and over the time-frames specified more taxa listed in a higher category are expected to go extinct than in a lower one (without effective conservation action). However, the persistence of some taxa in high risk categories does not necessarily mean their initial assessment was inaccurate.

6. **Data quality and the importance of inference and projection**

The criteria are clearly quantitative in nature. However, the absence of high quality data should not deter attempts at applying the criteria, as methods involving estimation, inference and projection are emphasised to be acceptable throughout. Inference and projection may be based on extrapolation of current or potential threats into the future (including their rate of change), or of factors related to population abundance or distribution (including dependence on other taxa), so long as these can reasonably be supported. Suspected or inferred patterns in either the recent past, present or near future can be based on any of a series of related factors, and these factors should be specified.

Taxa at risk from threats posed by future events of low probability but with severe consequences (catastrophes) should be identified by the criteria (e.g. small distributions, few locations). Some threats need to be identified particularly early, and appropriate actions taken, because their effects are irreversible, or nearly so (pathogens, invasive organisms, hybridization).

7. **Uncertainty**

The criteria should be applied on the basis of the available evidence on taxon numbers, trend and distribution, making due allowance for statistical and other uncertainties. Given that data are rarely available for the whole range or population of a taxon, it may often be appropriate to use the information that is available to make intelligent inferences about the overall status of the taxon in question. In cases where a wide variation in estimates is found, it is legitimate to apply the precautionary principle and use the estimate (providing it is credible) that leads to listing in the category of highest risk.

Where data are insufficient to assign a category (including Lower Risk), the category of 'Data Deficient' may be assigned. However, it is important to recognise that this category indicates that data are inadequate to determine the degree of threat faced by a taxon, not necessarily that the taxon is poorly known. In cases where there are evident threats to a taxon through, for example, deterioration of its only known habitat, it is important to attempt threatened listing, even though there may be little direct information on the biological status of the taxon itself. The category 'Data Deficient' is not a threatened category, although it indicates a need to obtain more information on a taxon to determine the appropriate listing.

8. Conservation actions in the listing process

The criteria for the threatened categories are to be applied to a taxon whatever the level of conservation action affecting it. In cases where it is only conservation action that prevents the taxon from meeting the threatened criteria, the designation of 'Conservation Dependent' is appropriate. It is important to emphasise here that a taxon require conservation action even if it is not listed as threatened.

9. Documentation

All taxon lists including categorisation resulting from these criteria should state the criteria and sub-criteria that were met. No listing can be accepted as valid unless at least one criterion is given. If more than one criterion or sub-criterion was met, then each should be listed. However, failure to mention a criterion should not necessarily imply that it was not met. Therefore, if a re-evaluation indicates that the documented criterion is no longer met, this should not result in automatic down-listing. Instead, the taxon should be re-evaluated with respect to all criteria to indicate its status. The factors responsible for triggering the criteria, especially where inference and projection are used, should at least be logged by the evaluator, even if they cannot be included in published lists.

10. Threats and priorities

The category of threat is not necessarily sufficient to determine priorities for conservation action. The category of threat simply provides an assessment of the likelihood of extinction under current circumstances, whereas a system for assessing priorities for action will include numerous other factors concerning conservation action such as costs, logistics, chances of success, and even perhaps the taxonomic distinctiveness of the subject.

11. Use at regional level

The criteria are most appropriately applied to whole taxa at a global scale, rather than to those units defined by regional or national boundaries. Regionally or nationally based threat categories, which are aimed at including taxa that are threatened at regional or national levels (but not necessarily throughout their global ranges), are best used with two key pieces of information: the global status category for the taxon, and the proportion of the global population or range that occurs within the region or nation. However, if applied at regional or national level it must be recognised that a global category of threat may not be the same as a regional or national category for a particular taxon. For example, taxa classified as Vulnerable on the basis of their global declines in numbers or range might be Lower Risk within a particular region where their populations are stable. Conversely, taxa classified as Lower Risk globally might be Critically Endangered within a particular region where numbers are very small or declining, perhaps only because they are at the margins of their global range. IUCN is still in the process of developing guidelines for the use of national red list categories.

12. Re-evaluation

Evaluation of taxa against the criteria should be carried out at appropriate intervals. This is especially important for taxa listed under Near Threatened, or Conservation Dependent, and for threatened species whose status is known or suspected to be deteriorating.

13. Transfer between categories

There are rules to govern the movement of taxa between categories. These are as follows: (A) A taxon may be moved from a category of higher threat to a category of lower threat if none of the criteria of the higher category has been met for 5 years or more. (B) If the original classification is found to have been erroneous, the taxon may be transferred to the appropriate category or removed from the threatened categories altogether, without delay (but see Section 9). (C) Transfer from categories of lower to higher risk should be made without delay.

14. Problems of scale

Classification based on the sizes of geographic ranges or the patterns of habitat occupancy is complicated by problems of spatial scale. The finer the scale at which the distributions or habitats of taxa are mapped, the smaller will be the area that they are found to occupy. Mapping at finer scales reveals more areas in which the taxon is unrecorded. It is impossible to provide any strict but general rules for mapping taxa or habitats; the most appropriate scale will depend on the taxa in question, and the origin and comprehensiveness of the distributional data. However, the thresholds for some criteria (e.g. Critically Endangered) necessitate mapping at a fine scale.

III) Definitions

1. **Population**
Population is defined as the total number of individuals of the taxon. For functional reasons, primarily owing to differences between life-forms, population numbers are expressed as numbers of mature individuals only. In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon should be used.

2. **Subpopulations**
Subpopulations are defined as geographically or otherwise distinct groups in the population between which there is little exchange (typically one successful migrant individual or gamete per year or less).

3. **Mature Individuals**
The number of mature individuals is defined as the number of individuals known, estimated or inferred to be capable of reproduction. When estimating this quantity the following points should be borne in mind:

- Where the population is characterised by natural fluctuations the minimum number should be used.

- This measure is intended to count individuals capable of reproduction and should therefore exclude individuals that are environmentally, behaviourally or otherwise reproductively suppressed in the wild.

- In the case of populations with biased adult or breeding sex ratios it is appropriate to use lower estimates for the number of mature individuals which take this into account (e.g. the estimated effective population size).

- Reproducing units within a clone should be counted as individuals, except where such units are unable to survive alone (e.g. corals).

- In the case of taxa that naturally lose all or a subset of mature individuals at some point in their life cycle, the estimate should be made at the appropriate time, when mature individuals are available for breeding.

4. **Generation**
Generation may be measured as the average age of parents in the population. This is greater than the age at first breeding, except in taxa where individuals breed only once.

5. **Continuing decline**
A continuing decline is a recent, current or projected future decline whose causes are not known or not adequately controlled and so is liable to continue unless remedial measures are taken. Natural fluctuations will not normally count as a continuing decline, but an observed decline should not be considered to be part of a natural fluctuation unless there is evidence for this.

6. **Reduction**
A reduction (criterion A) is a decline in the number of mature individuals of at least the amount (%) stated over the time period (years) specified, although the decline need not still be continuing. A reduction should not be interpreted as part of a natural fluctuation unless there is good evidence for this. Downward trends that are part of natural fluctuations will not normally count as a reduction.

7. **Extreme fluctuations**

Extreme fluctuations occur in a number of taxa where population size or distribution area varies widely, rapidly and frequently, typically with a variation greater than one order of magnitude (i.e., a tenfold increase or decrease).

8. **Severely fragmented**

Severely fragmented is refers to the situation where increased extinction risks to the taxon result from the fact that most individuals within a taxon are found in small and relatively isolated subpopulations. These small subpopulations may go extinct, with a reduced probability of recolonisation.

9. **Extent of occurrence**

Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy. This measure may exclude discontinuities or disjunctions within the overall distributions of taxa (e.g., large areas of obviously unsuitable habitat) (but see 'area of occupancy'). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).

10. **Area of occupancy**

Area of occupancy is defined as the area within its 'extent of occurrence' (see definition) which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may, for example, contain unsuitable habitats. The area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon (e.g. colonial nesting sites, feeding sites for migratory taxa). The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon. The criteria include values in km^2, and thus to avoid errors in classification, the area of occupancy should be measured on grid squares (or equivalents) which are sufficiently small (see Figure 2).

11. **Location**

Location defines a geographically or ecologically distinct area in which a single event (e.g. pollution) will soon affect all individuals of the taxon present. A location usually, but not always, contains all or part of a subpopulation of the taxon, and is typically a small proportion of the taxon's total distribution.

12. **Quantitative analysis**

A quantitative analysis is defined here as the technique of population viability analysis (PVA), or any other quantitative form of analysis, which estimates the extinction probability of a taxon or population based on the known life history and specified management or non-management options. In presenting the results of quantitative analyses the structural equations and the data should be explicit.

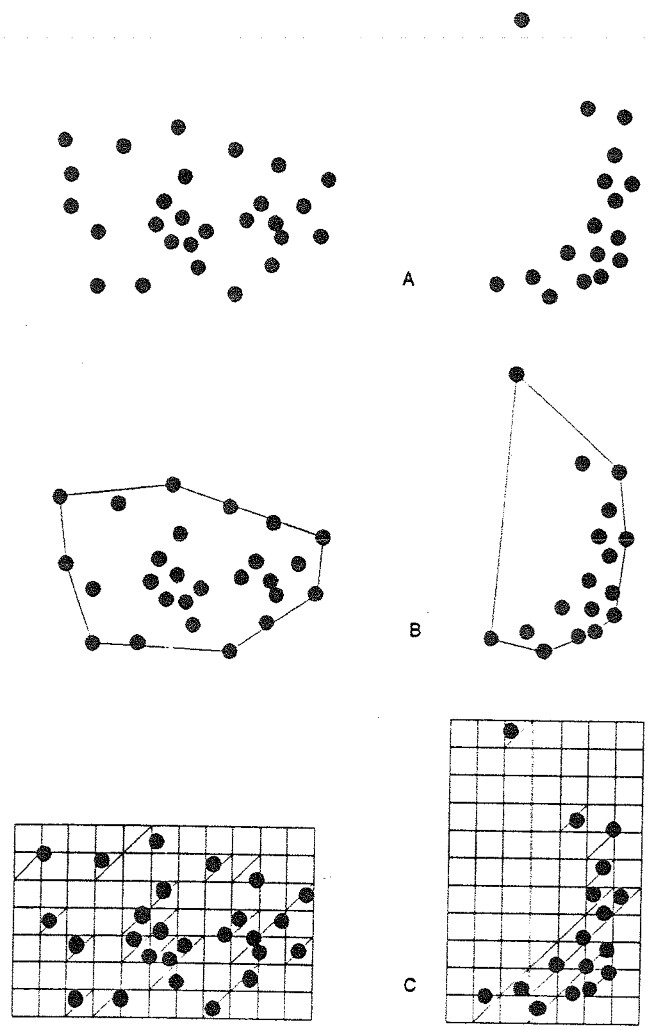


Figure 2:

Two examples of the distinction between extent of occurrence and area of occupancy. (a) is the spatial distribution of known, inferred or projected sites of occurrence. (b) shows one possible boundary to the extent of occurrence, which is the measured area within this boundary. (c) shows one measure of area of occupancy which can be measured by the sum of the occupied grid squares.

IV) The categories [1]

EXTINCT (EX)
A taxon is Extinct when there is no reasonable doubt that the last individual has died.

EXTINCT IN THE WILD (EW)
A taxon is Extinct in the wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR)
A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the criteria (A to E) on pages 12 and 13.

ENDANGERED (EN)
A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the criteria (A to E) on pages 14 and 15.

VULNERABLE (VU)
A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the criteria (A to D) on pages 16 and 17.

LOWER RISK (LR)
A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:

1. **Conservation Dependent (cd)**. Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.

2. **Near Threatened (nt)**. Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.

3. **Least Concern (lc)**. Taxa which do not qualify for Conservation Dependent or Near Threatened.

DATA DEFICIENT (DD)
A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution is lacking. Data Deficient is therefore not a category of threat or Lower Risk. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future

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[1] Note: As in previous IUCN categories, the abbreviation of each category (in parenthesis) follows the English denominations when translated into other languages.

research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and threatened status. If the range of a taxon is suspected to be relatively circumscribed, if a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

NOT EVALUATED (NE)
A taxon is Not Evaluated when it is has not yet been assessed against the criteria.

V) The Criteria for Critically Endangered, Endangered and Vulnerable

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the following criteria (A to E):

A) Population reduction in the form of either of the following:

1) An observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:

a) direct observation
b) an index of abundance appropriate for the taxon
c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
d) actual or potential levels of exploitation
e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.

2) A reduction of at least 80%, projected or suspected to be met within the next ten years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d) or (e) above.

B) Extent of occurrence estimated to be less than 100 km^2 or area of occupancy estimated to be less than 10 km^2, and estimates indicating any two of the following:

1) Severely fragmented or known to exist at only a single location.

2) Continuing decline, observed, inferred or projected, in any of the following:

a) extent of occurrence
b) area of occupancy
c) area, extent and/or quality of habitat
d) number of locations or subpopulations
e) number of mature individuals.

3) Extreme fluctuations in any of the following:

a) extent of occurrence
b) area of occupancy
c) number of locations or subpopulations
d) number of mature individuals.

C) Population estimated to number less than 250 mature individuals and either:

1) An estimated continuing decline of at least 25% within 3 years or one generation, whichever is longer or

2) A continuing decline, observed, projected, or inferred, in numbers of mature

individuals and population structure in the form of either:

a) severely fragmented (i.e. no subpopulation estimated to contain more than 50 mature individuals)
b) all individuals are in a single subpopulation.

D) Population estimated to number less than 50 mature individuals.

E) Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or 3 generations, whichever is the longer.

ENDANGERED (EN)

A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the following criteria (A to E):

A) Population reduction in the form of either of the following:

1) An observed, estimated, inferred or suspected reduction of at least 50% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:

a) direct observation
b) an index of abundance appropriate for the taxon
c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
d) actual or potential levels of exploitation
e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.

2) A reduction of at least 50%, projected or suspected to be met within the next ten years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d), or (e) above.

B) Extent of occurrence estimated to be less than 5000 km^2 or area of occupancy estimated to be less than 500 km^2, and estimates indicating any two of the following:

1) Severely fragmented or known to exist at no more than five locations.

2) Continuing decline, inferred, observed or projected, in any of the following:

a) extent of occurrence
b) area of occupancy
c) area, extent and/or quality of habitat
d) number of locations or subpopulations
e) number of mature individuals.

3) Extreme fluctuations in any of the following:

a) extent of occurrence
b) area of occupancy
c) number of locations or subpopulations
d) number of mature individuals.

C) Population estimated to number less than 2500 mature individuals and either:

1) An estimated continuing decline of at least 20% within 5 years or 2 generations, whichever is longer, or

2) A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:

a) severely fragmented (i.e. no subpopulation estimated to contain more than 250 mature individuals)

b) all individuals are in a single subpopulation.

D) Population estimated to number less than 250 mature individuals.

E) Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or 5 generations, whichever is the longer.

VULNERABLE (VU)

A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the following criteria (A to E):

A) Population reduction in the form of either of the following:

1) An observed, estimated, inferred or suspected reduction of at least 20% over the last 10 years or three generations, whichever is the longer,, based on (and specifying) any of the following:

a) direct observation
b) an index of abundance appropriate for the taxon
c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
d) actual or potential levels of exploitation
e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.

2) A reduction of at least 20%, projected or suspected to be met within the next ten years or three generations, whichever is the longer, based on (and specifying) any of (b), (c), (d) or (e) above.

B) Extent of occurrence estimated to be less than 20,000 km^2 or area of occupancy estimated to be less than 2000 km^2, and estimates indicating any two of the following:

1) Severely fragmented or known to exist at no more than ten locations.

2) Continuing decline, inferred, observed or projected, in any of the following:

a) extent of occurrence
b) area of occupancy
c) area, extent and/or quality of habitat
d) number of locations or subpopulations
e) number of mature individuals.

3) Extreme fluctuations in any of the following:

a) extent of occurrence
b) area of occupancy
c) number of locations or subpopulations
d) number of mature individuals.

C) Population estimated to number less than 10,000 mature individuals and either:

1) An estimated continuing decline of at least 10% within 10 years or 3 generations, whichever is longer, or

2) A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either:

a) severely fragmented (i.e. no subpopulation estimated to contain more than 1000 mature individuals)
b) all individuals are in a single subpopulation.

D) Population very small or restricted in the form of either of the following:

1) Population estimated to number less than 1000 mature individuals.

2) Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km^2) or in the number of locations (typically less than 5). Such a taxon would thus be prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and is thus capable of becoming Critically Endangered or even Extinct in a very short period.

E) Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.