CAPRINAE CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

Edited by
Larry Killmar, Jim Dolan, Onnie Byers, Susie Ellis, and Ulysses Seal

Compiled by the participants of
the Caprinae CAMP Workshop
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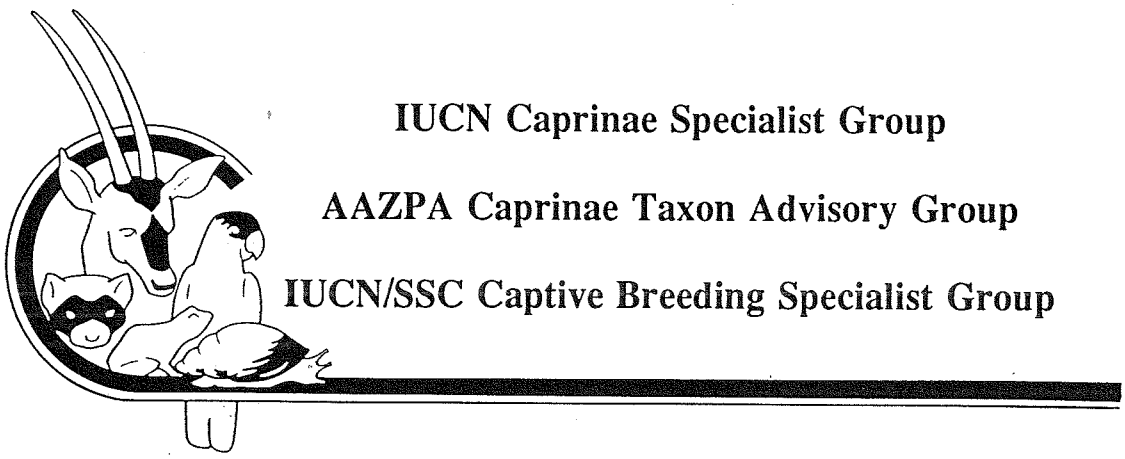

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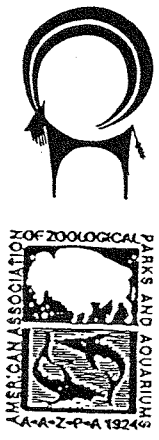

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7/30/93

CAPRINAE CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

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CONSERVATION ASSESSMENT AND MANAGEMENT PLAN FOR CAPRINAE EXECUTIVE SUMMARY

Caprinae taxa were reviewed taxon-by-taxon to assign a category of threat based on Mace-Lande criteria and to recommend intensive conservation action. The recommendations contained in the Caprinae Conservation Assessment and Management Plan are based only on conservation criteria; adjustments for political and other constraints will be the responsibility of regional plans.

For this exercise, 89 distinct taxa (subspecies or species if no subspecies are contained therein) of Caprinae were considered. 62 of the 89 taxa (70%) were assigned to one of three categories of threat, based on the Mace-Lande criteria:

Critical	10 taxa
Endangered	22 taxa
Vulnerable	30 taxa

25 taxa were assigned to the Safe category, according to Mace-Lande criteria. None of the taxa were assigned to the Unknown/questionable category of threat because of insufficient information. However, 2 taxa were listed as Extinct.

51 of the 89 taxa (57%) were recommended for Population and Habitat Viability Assessment workshops.

Research Management was recommended for 80 taxa (90%) in the following categories:

Survey	54 taxa
Monitoring	5 taxa
Life history research	1 taxon
Limiting factors research	1 taxon
Limiting factors management	32 taxa
Habitat management	26 taxa
Taxonomic research	38 taxa
Translocation	0 taxa

45 of the 89 Caprinae taxa (50%) were recommended for one of two time-frames for development of captive programs (based in part on Mace-Lande criteria):

Increase ongoing program	0 taxa
Initiate/increase within 0-3 years	30 taxa
Initiate/increase in the future (>3 years)	1 taxon

An additional 30 taxa were not recommended for captive programs, but may be reconsidered following a formal Population and Habitat Viability Assessment or when further data become available.

CAPRINAE

CONSERVATION ASSESSMENT AND MANAGEMENT PLAN (CAMP)

SECTION 1

CAPRINAE CAMP OVERVIEW

CAPRINAE CONSERVATION ASSESSMENT AND MANAGEMENT PLAN

Introduction.

Reduction and fragmentation of wildlife populations and habitat is occurring at a rapid and accelerating rate. For an increasing number of taxa, the results are small and isolated populations at the 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 will not be quelled, and which will lead to a decreased capacity for all other species 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.

The successful preservation of wild species and ecosystems necessitates development and implementation of active management programs by people and governments living within the range area of the species in question. The recommendations contained within this document are based on conservation need only; adjustments for political and other constraints are the responsibility of regional governmental agencies charged with the preservation of flora and fauna within their respective countries.

Conservation Assessment and Management Plans (CAMPs).

Within the Species Survival Commission (SSC) of IUCN-The World Conservation Union, the primary goal of the Captive 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 the development of Conservation Assessment and Management Plans (CAMPs), both on a global and a regional basis, with the goal of facilitating an integrated approach to species management for conservation.

CAMPs provide strategic guidance for the application of intensive management techniques that are increasingly required for survival and recovery of threatened taxa. CAMPs are also one means of testing the applicability of the Mace-Lande criteria for threat as well as the scope of its applicability. Additionally, CAMPs are an attempt to produce ongoing summaries of current data for groups of taxa, providing a mechanism for recording and tracking of species' status.

In addition to management in the natural habitat, conservation programs leading to viable populations of threatened species may sometimes need a captive component. In general, captive populations and programs can serve several roles in holistic conservation: 1) as genetic and demographic reservoirs that can be used to reinforce wild populations whether by

revitalizing populations that are languishing in natural habitats or by re-establishing by translocation populations that have become depleted or extinct; 2) by 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 as well as generate funds for *in situ* conservation.

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

The CAMP Process.

The CAMP process assembles expertise on wild and captive management for the taxonomic group under review in an intensive and interactive workshop format. The purpose of the Caprinae Conservation Assessment and Management Plan (CAMP) workshop was to assist in the development of a conservation strategy for Caprinae, and to continue to test the applicability of the Mace-Lande criteria. A large amount of data used in the CAMP process came from the authors of the Caprine Action Plan. On 15-17 March, 1993, 17 individuals met in San Diego, California, to review, refine, and develop further conservation strategies for Caprinae. This group was self-selected from more than 20 individuals invited to attend, and represented field biologists, wildlife experts, conservation biologists, academic scientists, and captive managers. Participants and invitees are listed in Section 4, Appendix I.

Participants worked together in two small groups to: 1) determine best estimates of the status of all Caprinae; 2) assign each taxon to a Mace-Lande category of threat; and 3) identify areas of action and information needed for conservation and management purposes.

The assessments and recommendations of each of the working groups for each taxon were circulated to the entire group prior to final consensus by all participants, as represented in this document. Summary recommendations concerning research management, assignment of all taxa to threatened status, and captive breeding were supported by the workshop participants.

CAMP Workshop Goals.

The goals of the Caprinae CAMP workshop were:

1) To review the population status and demographic trends for Caprinae, to test the applicability of the Mace-Lande criteria for threat, and to discuss management options for Caprinae taxa.

2) To provide recommendations for *in situ* and *ex situ* management, research and information-gathering for all Caprinae taxa, including: recommendations for PHVA

workshops; more intensive management in the wild; taxonomic research, survey, monitoring, investigation of limiting factors, taxonomy, or other specific research.

3) Produce a discussion draft Conservation Assessment and Management Plan for Caprinae, presenting the recommendations from the workshop, for distribution to and review by workshop participants and all parties interested in Caprine conservation.

Taxonomy.
Taxonomy serves to identify populations of animals on the basis of their similarities and differences. Thus, a correct classification of taxa is an important instrument for conservation. The systematics of nearly all members of the Caprinae deserves some revision, to different extents, by pooling together information from different scientific disciplines. Analytical techniques and sample sizes can affect results: one should be cautious not to overemphasize the importance of certainly powerful - but also "fashionable" - methods.

The taxonomy of the genera *Capricornis* and *Nemorhaedus* is in desperate need of revision. There are many unanswered questions and questionable subspecies. This, in turn, affects the status of these two genera. The same can be said for the sheep native to Central Asia, and the former Soviet Union. In essence, the entire sheep, goats, and Rupicaprines need to be reviewed.

Distribution.
For most members of this subfamily, the distribution information is sketchy, at best. For conservation purposes, it is very important that we increase our knowledge of the exact distributions of the various genera. This is particularly true of Central, Eastern and Southeastern Asia. If one looks at the CAMP Taxon Reports one sees immediately that for over 90% of the taxa, population and distribution surveys are deemed necessary.

Assignment to Mace-Lande Categories of Threat.
All Caprinae taxa were evaluated on a taxon-by-taxon basis in terms of their current and projected status in the wild to assign priorities for conservation action or information-gathering activities. The workshop participants applied the criteria proposed for the redefinition of the IUCN Red Data Categories proposed by Mace and Lande in their 1991 paper (Section 4, Appendix II). The Mace-Lande scheme assesses threat in terms of a likelihood of extinction within a specified period of time (Table 1). The system defines three categories for threatened taxa:

Critical 50% probability of extinction within five years or two generations, whichever is longer.

Endangered 20% probability of extinction within 20 years or 10 generations, whichever is longer.

Vulnerable 10% probability of extinction within 100 years.

Table 1. MACE-LANDE CATEGORIES AND CRITERIA FOR THREAT

POPULATION TRAIT	CRITICAL	ENDANGERED	VULNERABLE
Probability of extinction	50% within 5 years or 2 generations, whichever is longer	20% within 20 years or 10 generations, whichever is longer	10% within 100 years
	OR	**OR**	**OR**
	Any 2 of the following criteria:	Any 2 of following criteria or any 1 CRITICAL criterion	Any 2 of following criteria or any 1 ENDANGERED criterion
Effective population N_e	$N_e < 50$	$N_e < 500$	$N_e < 2{,}000$
Total population N	$N < 250$	$N < 2{,}500$	$N < 10{,}000$
Subpopulations	≤ 2 with $N_e > 25$, $N > 125$ with immigration < 1/generation	≤ 5 with $N_e > 100$, $N > 500$ or ≤ 2 with $N_e > 250$, $N > 1{,}250$ with immigration < 1/gen.	≤ 5 with $N_e > 500$, $N > 2{,}500$ or ≤ 2 with $N_e > 1{,}000$, $N > 5{,}000$ with immigration < 1/gen.
Population Decline	> 20%/yr. for last 2 yrs. or > 50% in last generation	> 5%/yr. for last 5 years or > 10%/gen. for last 2 years	> 1%/yr. for last 10 years
Catastrophe: rate and effect	> 50% decline per 5-10 yrs. or 2-4 generations; subpops. highly correlated	> 20% decline/5-10 yrs, 2-4 gen > 50% decline/10-20 yrs, 5-10 gen with subpops. highly correlated	> 10% decline/5-10 yrs. > 20% decline/10-20 yrs. or > 50% decline/50 yrs. with subpops. correlated
OR			
Habitat Change	resulting in above pop. effects	resulting in above pop. effects	resulting in above pop. effects
OR			
Commercial exploitation or Interaction/introduced taxa	resulting in above pop. effects	resulting in above pop. effects	resulting in above pop. effects

Definitions of these criteria are based on population viability theory. To assist in making recommendations, participants in the workshop were encouraged to be as quantitative or numerate as possible for two reasons: 1) Conservation Assessment and Management Plans ultimately must establish numerical objectives for viable population sizes and distributions; 2) numbers provide for more objectivity, less ambiguity, more comparability, better communication, and hence cooperation. During the workshop, there were many attempts to estimate if the total population of each taxon was greater or less than the numerical thresholds for the three Mace-Lande categories of threat. In many cases, current population estimates for Caprinae taxa were not available or were available for taxa within a limited part of their distribution. In all cases, conservative numerical estimates were used. **Where population numbers are estimated, these estimates represent first-attempt, order-of-magnitude guesstimates. As such, the workshop participants emphasize that these guesstimates should not be used as an authoritative estimate for any other purpose than was intended by this process.**

In assessing threat according to Mace-Lande criteria, workshop participants also used information on the status and interaction of habitat and other characteristics. Information about population trends, fragmentation, range, and environmental stochasticity, real and potential, were also considered.

Numerical information alone was insufficient for assignment to one of the Mace-Lande categories of threat. For example, based solely on numbers, a taxon might be assigned to the Vulnerable or Safe category. Knowledge of the current and predicted threats or fragmentation of remaining natural habitat, however, may lead to assignment to a higher category of threat.

In several cases, there was not enough information available for assignment to one of the three categories of threat; these taxa are listed as unknown or questionable. Assignment to Mace-Lande categories of threat for the 89 taxa examined during this CAMP exercise are presented in Table 2. Specific taxa within each Mace-Lande category are presented in Tables 7-9 in Section 2. Table 10 in Section 2 shows Mace-Lande categorization and recommendations for all Caprine taxa.

Table 2. Threatened Caprinae Taxa - Mace-Lande Categories of Threat.

MACE-LANDE CATEGORY	NUMBER OF TAXA	PERCENT OF TOTAL
Critical	10	11
Endangered	22	25
Vulnerable	30	34
Safe	25	28
Unknown/ questionable	0	0
Extinct?	2	2
TOTAL	89	100

One of the goals of the CAMP workshop was to test the applicability of the Mace-Lande criteria for threat, which were designed in an attempt to redefine the current IUCN categories of threat. A comparison of Mace-Lande and IUCN classification results is presented in Table 3. Fourteen of the Caprinae taxa assigned to a Mace-Lande category of threat are listed as threatened under IUCN classification; 48 taxa assigned to Mace-Lande categories of threat are not listed in the *1990 IUCN Red List of Threatened Animals*. Assuming that Mace-Lande criteria are at least as sensitive as those of IUCN, the number of threatened taxa has increased.

Table 3. Threatened Caprinae of the world - comparison of Mace-Lande and current IUCN categories of threat.

MACE-LANDE	END	VUL	RARE	INDET	K	NOT	TOTAL
Critical	3	2	0	0	0	5	10
Endangered	3	6	2	0	0	11	22
Vulnerable	0	6	0	1	0	23	30
TOTAL	6	14	2	1	0	39	62

Regional Distribution of Threatened Taxa.

Regional distribution of threatened taxa is presented in Table 4. The majority of threatened Caprine taxa are found in the Eurasian region, followed by Southeast Asia and China and, lastly, the African region.

Table 4. Regional distribution of threatened Caprinae taxa.

MACE-LANDE	Africa	Eurasia	C+S Amer	N.America	Australas	SE Asia + China	TOTAL
Critical	4	6	0	0	0	0	10
Endangered	2	9	0	2	1	7	21
Vulnerable	3	18	0	0	0	9	30
TOTAL	9	33	0	2	1	16	61

Threats to Caprinae.
Workshop participants outlined the following threats for Caprinae:

Over-hunting, poaching, and habitat fragmentation lead to rapid decline of populations, down to extinction. These are threats particularly important to Caprinae; they are traditional game and trophy animals, mostly dwelling in mountainous terrain where habitats are especially fragile. If granted habitat protection and protection from excessive hunting, then Caprinae readily recover and thrive, becoming an economic asset.

Domestic sheep, goats and, to a lesser extent, cattle are closely related to wild Caprinae and share similar biological requirements. Consequently, **competition** arises between these two groups. The competition is both direct and indirect (i.e., food and habitat-use) and can be severe. In addition, while **diseases** and parasites are more often transmitted from domestic to wild forms, the former can readily benefit from veterinary treatment but the latter rarely can.
Standard procedures for reintroduction or restocking programs must include screening of all animals for diseases and parasites, so that only disease-free animals are released into the wild.

Additional events that either directly or indirectly affect populations include: drought, war, genetic problems, hybridization, human interference and predation.

Recommendations for Intensive Management and Research Actions.
For all taxa, recommendations were generated for the kinds of intensive action necessary, both in terms of management and research, that were felt to be necessary for conservation. These recommendations, summarized in Table 5, were: Population and Habitat Viability Assessment (PHVA) workshops; wild management and research; and captive programs. PHVA workshops provide a means of assembling available detailed biological information on the respective taxa, evaluating the threats to their habitat, development of management scenarios with immediate and 100-year time-scales, and the formulation of specific adaptive management plans with the aid of simulation models. In many cases, workshop participants determined that the current level of information for a taxa was inadequate for conduction of a PHVA; in those cases, recommendations are listed as "PHVA Pending."

Workshop participants attempted to develop an integrated approach to management and research actions needed for the conservation of Caprinae taxa. In all cases, an attempt was made to make management and research recommendations based on the various levels of threat impinging on the taxa. For the purposes of the CAMP process, threats were defined as "immediate or predicted events that are or may cause significant population declines."

With minimal understanding of underlying causes for decline in some taxa, it was sometimes difficult to clearly define specific management actions needed for conservation. Therefore, "research management" must become a component of conservation and recovery activities. Research management can be defined as a management program which includes a strong feedback between management activities and an evaluation of the efficacy of the management, as well as response of the Caprinae taxa to that activity. Seven basic categories of research management activities were identified: survey (e.g., search and find); monitoring; translocation; taxonomic research or clarification; management of limiting factors; limiting factors research; and life history research. The frequent need for survey information to evaluate population status, especially for those taxa listed as Critical, emphasizes the need to quickly implement intensive methodologies for determining the existence of at least 13 taxa. Research management recommendations are summarized in Table 5.

Table 5. Caprinae research management recommendations.

MACE-LANDE	PHVA	SURVEY	MONITR	LIFE HISTORY RESRCH	LIMITING FACTORS RESRCH	LIMITING FACTORS MGMT	HABITAT MGMT	TAXON RESRCH	TRNSLOC
Critical	8	8	0	1	1	5	2	4	0
Endangered	19	17	1	0	0	8	11	14	0
Vulnerable	22	23	4	0	0	13	13	15	0
Safe	2	5	10	0	0	6	0	5	0
Unknown	0	1	0	0	0	0	0	0	0
TOTAL	51	54	5	1	1	32	26	38	0

Captive Program Recommendations.

For a few of the Caprinae taxa, it was determined that a captive component would be necessary to contribute to the maintenance of long-term viable populations. It is proposed that, when captive populations can assist species conservation, captive and wild populations should be intensively and interactively managed with interchanges of animals occurring as needed and as feasible. There may be problems with interchange between captive and wild populations with regard to disease, logistics, and financial limitations.

Today, as more and more species are threatened with population declines, cooperative recovery programs, including both zoos and the private sector, may provide a major avenue for survival. This cooperation must include support for field research, habitat conservation, as well as public education.

During the CAMP workshop, all Caprinae taxa were evaluated relative to their current need for captive propagation. Recommendations were based on a number of variables, including: immediate need for conservation (population size, Mace-Lande status, population trend, type of captive propagation program), need for or suitability as a surrogate species, current captive populations, and determination of difficulty as mentioned above. Based on all of the above considerations, in addition to threats, trends, and Mace-Lande assessment, recommendations for captive programs were made. These recommendations, by category of threat, are presented in Table 6. Recommendations for levels of programs are presented in the spreadsheets in Section 2. Information concerning the current populations of Caprinae in captivity (according to the International Species Information System) are presented in Section 3.

Table 6. Captive program recommendations for Caprinae by Mace-Lande threat category.

MACE-LANDE	Initiate/ increase immediately 0-3 yrs	Initiate/ increase future > 3 yrs	N-1	N-2	Not currently recommended pending data or PHVA	Not currently recommended
Critical	6	0	0	0	4	0
Endangered	18	0	2	0	2	0
Vulnerable	5	1	5	4	14	1
Safe	1	0	3	0	10	11
Unknown	0	0	0	0	0	2
TOTAL	30	1	10	4	30	14

CAPRINAE

CONSERVATION ASSESSMENT AND MANAGEMENT PLAN (CAMP)

SECTION 2

SPREADSHEET CATEGORIES, SPREADSHEETS AND TAXON REPORTS

CAPRINAE

CONSERVATION ASSESSMENT AND MANAGEMENT PLAN (CAMP)

SPREADSHEET CATEGORIES

(17 March 1993)

The Conservation Assessment and Management Plan (CAMP) spreadsheet is a working document that provides information that can be used to assess the degree of threat and recommend conservation action.

The first part of the spreadsheet summarizes information on the status of the wild and captive populations of each taxon. It contains taxonomic, distributional, and demographic information useful in determining which taxa are under greatest threat of extinction. This information can be used to identify priorities for intensive management action for taxa.

TAXON

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

WILD POPULATION

IMPORTANT Estimates of population and numbers of sub-populations followed by "?" are guesses, and should not be viewed otherwise. Similarly many species geographic distribution areas are also guesses. Area codes followed by a "?" are based on old distribution information.

RANGE: Geographical area where a species and its subspecies occur.

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

DQ (Data Quality):

1 = Recent (<8 years) census or population monitoring
2 = Recent (<8 years) general field study
3 = Recent (<8 years) annecdotal field sightings
4 = Indirect information (trade numbers, habitat availability).

Any combination of above = different data quality in parts of range.

SUB-POP: Number of populations within the taxonomic unit. Ideally, the number of populations is described in terms of boundary conditions as delineated by Mace-Lande and indicates the degree of fragmentation.

TRND: Indicates whether the natural trend of the species/subspecies/population is currently (over the past 3 generations) increasing (I), decreasing (D), or stable (S). Note that trends should NOT reflect supplementation of wild populations. A + or - may be indicated to indicate a rapid or slow rate of change, respectively.

AREA: A quantification of a species' geographic distribution.

AAA: > 5,000 sq km; geographic island
AA: < 5,000 sq km; geographic island
AA-1: < 1,000 sq km; geographic island
AA-2: < 100 sq km; geographic island
AA-3: < 10 sq km; geographic island

M/L STS: Status according to Mace/Lande criteria (see attached explanation).
C = Critical
E = Endangered
V = Vulnerable
U = Unknown
EXT = Extinct
S = Safe

THREATS: Immediate or predicted events that are or may cause significant population declines.
A = Aircraft
C = Climate
D = Disease
Dr = Drought
F = Fishing
G = Genetic problems
H = Hunting for food or other purposes
Hp = Illegal hunting (poaching)
Hyb = Hybridization
I = Human interference or disturbance
Ic = Interspecific competition
Ice = Interspecific competition from exotics
L = Loss of habitat
La = Loss of habitat because of exotic/domestic animals
Lf = Loss of habitat because of fragmentation
Lp = Loss of habitat because of exotic/domestic plants
M = Marine perturbations, including ENSO and other shifts
P = Predation
Pe = Predation by exotics
Ps= Pesticides
Pl= Powerlines
Po= Poisoning

Pu= Pollution
S = Catastrophic events
    f: fire
    h: hurricane
    t: tsunami
T = Trade for the live animal market
W = War

PHVA/WKSP: Is a Population and Habitat Viability Assessment Workshop recommended?
Yes or No? NOTE**A detailed model of a species' biology is frequently not needed to make sound management decisions.
Yes or No/Pending: pending further data from surveys or other research

Research Management:

It should be noted that there is (or should be) a clear relationship between threats and subsequent outlined research/management actions. The "Research/Management" column provides an integrated view of actions to be taken, based on the listed threats. Research management can be defined as a management program which includes a strong feedback between management activities and an evaluation of the efficacy of the management, as well as response of the species to that activity. The categories within the column are as follows:

T	=	Taxonomic and morphological genetic studies
Tl	=	Translocations
S	=	Survey - search and find
M	=	Monitoring - to determine population information
Hm	=	Habitat management - management actions primarily intended to protect and/or enhance the species' habitat (e.g., forest management)
Lm	=	Limiting factor management - "research management" activities on known or suspected limiting factors. Management projects have a research component that provide scientifically defensible results.
Lr	=	Limiting factor research - research projects aimed at determining limiting factors. Results from this work may provide management recommendations and future research needs
Lh	=	Life history studies

CAPTIVE PROGRAMS

REC: Recommendation for development and time frame of captive program

I-1	=	Initiate/Increase captive program immediately, within 0-3 years
I-2	=	Initiate/Increase captive program in the future, within 3 or more years
N	=	Not currently recommended
Np	=	Not currently recommended but may be reconsidered pending further data

PROG TYPE: Recommendation for the type of captive program defined by its genetic and demographic objectives and hence the target population required to achieve these objectives.

E = Captive population should be developed and managed that is sufficient to preserve 90% of the genetic diversity of a population for 100 years. Program should be developed within 3 years. This is an emergency program based on the present availabilty of genetically diverse founders.

N = Captive population should be developed and managed that is a nucleus of 50-100 individuals organized with the aim to represent as much of the wild gene pool as possible. This program may require periodic importation of individuals from the wild population to maintain this high level of genetic diversity in a limited captive population. View this type of program as protection against potential extripation of wild populations.

S = Captive population should be developed to be used as a surrogate for other populations that may be more rare or more difficult to maintain.

DIFF: This column represents the level of difficulty in maintaining the species in captive conditions. It should be noted that there is little experience with the development of self-sustaining captive populations of caprinae.

1 = Techniques are in place for capture, maintenance, and propagation of similar taxa in captivity, which ostensibly could be applied to the taxon. Least difficult.

2 = Techniques are only partially in place for capture, maintenance, and propagation of similar taxa in captivity, and many captive techniques still need refinement. Moderate difficulty.

3 = Techniques are not in place for capture, maintenance, and propagation of similar taxa in captivity, and captive techniques still need to be developed. Very difficult.

NUM: Number of individuals in captivity

Table 7. Caprine taxa categorized as Critical or Endangered according to Mace-Lande Criteria.

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
26	*Rupicapra*	*rupicapra cartusiana*	N of Grenoble	<150	1	1	D	C	C	Hp,Hyb, La,Ic	Y	Hm	I-1		0
43	*Ammotragus*	*lervia fassini*	Bou Hedma Reserve, SE Tunisia	<200?	3-4	10+?	D	D?	C	H,La	Y	T,S	I-1	0	15
45	*Ammotragus*	*lervia blainei*	Egypt, Sudan & Libya borders	<200?	3-4	10?	D	D?	C	H,La	Y	T,S	I-1	0	4+
59	*Capra*	*aegagrus chialtanensis*	Pakistan	<500	3	1	D?	AA-2?	C/E	Hp,Ice	Y	Lm,T, S	N-Pend		0
68	*Capra*	*nubiana nubiana*	Egypt, Sudan, Ethiopia	200-1,000?	4	>10?	D	AA/B?	C/E	L,Hp,La, Dr	Y	S,T,L m,Ln	N-Pend		<50
69	*Capra*	*walia*	Ethiopia, (Simen Mts)	<400?	3	1	S/D	AA-2?	C/E	L,Hp,I,Ic e	Y	S,Hm	N-Pend	0	0
72	*Capra*	*pyrenaica pyrenaica*	N Spain	10	1	1	D?	AA-3?	C	Hp,Ice,G ?	Y	Lr	N-Pend		0
90	*Ovis*	*vignei vignei*	NE Pakistan, NW India to Indus River	<2,000	2-3	>2	D+?	C?	C/E	Hp,Ice	Y(w. mark hor)	S,Lm	I-1	0	0
91	*Ovis*	*ammon bochariensis*	Tadjikhistan	1,000	3	?	D		C/E	Hp,Ice, Dr	N	S,Lm	I-1		0?
98	*Ovis*	*ammon nigrimontana*	Kazakhstan, Kara Tau Mts	250?	3-4	?	D+	?	C	Hp, Ice	N	S,Lm	I-1	1	0?
2	*Capricornis*	*sumatraensis sumatraensis*	Malaya & Sumatra	<1,500?	2-3	10+?	D	F?	E	Hp,Lf	Y	T,S,H m	N-1		12-15

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
3	*Capricornis*	*sumatraensis maritimus*	Laos, Vietnam, Thailand & Burma	2,000?	3	20+?	D	G?	E	Hp,Lf	Y	T,S,H m	I-1		8-10
5	*Capricornis*	*sumatraensis rubidus*	Burma, India	<2,500?	2-3	20+?	D	F?	E	Hp,Lf	Y	T,S,H m	I-1		4-5?
11	*Nemorhaedus*	*baileyi baileyi*	S.E. Tibet	<2,000?	2	2+?	D	B?	E	Hp,Lf	Y	T,S,H m	I-1		15-20
12	*Nemorhaedus*	*baileyi cranbrooki*	Assam & upper Burma	<2,000?	3-4	2+?	D	C?	E	Hp,Lf	Y	T,S,H m	I-1	2	0
14	*Nemorhaedus*	*caudatus caudatus*	N Eastern China, E Russia, Korea	<2,000?	2-3	10+?	D	G?	E	Hp,Lf	Y	T,S,H m	I-1	2	10+
15	*Nemorhaedus*	*caudatus evansi*	Burma & Thailand	<2,000?	3	3+?	D	E?	E	Hp,Lf	Y	T,S,H m	I-1		0
28	*Rupicapra*	*rupicapra tatrica*	Tatras	<1,000	2,3	2	D	C	E	Hp,Hyb,I	Y	Hm,T	I-1		0
32	*Rupicapra*	*pyrenaica ornata*	Apennines	<500	1	2	I	C	E	La	Y	T	N-1		20
40	*Budorcas*	*taxicolor bedfordi*	Qinling Mountains	1,200	2,3	0	D	B	E	H,L	Y	Hm	I-1	0	20
47	*Ammotragus*	*lervia sahariensis*	Chad, Ahaggar, Tibesti, Tassili n'Azdjer	<2,500?	3-4	?	D	D?	E	H,La	Y	T,S	I-1	0	160
51	*Pseudois*	*schaeferi*	Yangtze river valley near Bantang	<2,500?	3	1	D	AA-2	E/C	H	Y	T	I-1		0
53	*Hemitragus*	*hylocrius*	Nilgiri Hills to W. Ghats	<2,500	2	10+	D	B	E	Hp,L,I	Y	Hm	I-1	20	30+
54	*Hemitragus*	*jayakari*	Northern Oman	1,000?	3-4	?	D	C	E	La,Ice	Y	S	I-1		10+
63	*Capra*	*falconeri megaceros*	Pakistan, Afghanistan	<1,000	2-4	>5	D	C?	E/C	H,Hp,Ice	Y	Lm,S, H	I-1	0	0

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
64	*Capra*	*falconeri heptneri*	Dashtidjum district, Tadjikistan	<700	3	1?	D	B?	E/C	Hp,War	Y	Lm,S	I-1	62	<200
77	*Capra*	*cylindricornis*	eastern 2/3 of Caucasus	<15,000	3	1?	D+?	B?	E	Hp,Ice, War	N	S,M,Lm	I-1	9	<10
88	*Ovis*	*vignei punjabiensis*	N. Pakistan	<1,500	3	>5	D	B?	E	Hp,Ice,D	N	S,Lm	I-1		0
89	*Ovis*	*vignei severtzovi*	Uzbekistan	1,500?	3-4	?	S?	B?	E/V	Hp,Ice	N	S,Lm	N-Pend		?
95	*Ovis*	*ammon jubata*	Northern + NW China	<700?	3-4	>2?	D	?	E	Hp	Y	T,S,Lm	N-Pend		0
104	*Ovis*	*canadensis cremnobates + weemsi*	SW Calif & Baja Calif	<3,000 ?	3-4	>2?	C/E	?	E	Hp,D,Ice,L	Y	T?,S, Lm	I-1	9	10
105	*Ovis*	*canadensis mexicana*	N. Mexico, Sonoran Desert	<500	3-4	>2?	D	?	E/C	D,Hp,Ice,L	Y	S,Lm, T?	I-1	12	12

TAXON REPORTS FOR CRITICAL AND ENDANGERED TAXA.

SPECIES: *Rupicapra rupicapra cartusiana*
STATUS:
Mace-Lande: Critical
CITES:
IUCN: Endangered
Other
Taxonomic status:
Distribution: North of Grenoble.
Wild Population: < 150
Field Studies:
Threats: Poaching, Hybridization, Loss and fragmentation of habitat because of deforestation, Interspecific competition
Comments: Introduction of Alpine Chamois should be avoided, although this has already been done. Genetic studies have shown them to be somewhat different than the Alpine, but morphologically the same.
Recommendations:
Research management: Habitat management
PHVA: Yes
Other:
Captive Population: None
Captive Program Recommendation: Initiate a captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Ammotragus lervia fassini*
STATUS:
Mace-Lande: Critical
CITES: II
IUCN: Vulnerable
Other: Protected in Tunisia
Taxonomic status:
Distribution: Libya and southeastern Tunisia
Wild Population: < 200
Field Studies:
Threats: Hunting, Loss of habitat because of exotic/domestic animals
Comments:
Recommendations:
Research management: Taxonomic and morphological genetic studies, Survey
PHVA: Yes
Other:
Captive Population: 15 (Bou Hedma Reserve, Southeastern Tunisia
Captive Program Recommendation: Increase captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Ammotragus lervia blainei*
STATUS:
Mace-Lande: Critical
CITES: II
IUCN: Vulnerable
Other:
Taxonomic status:
Distribution: In the Sudan, west of the Nile, in Dongola, Kordofan, and Darfur
Wild Population: < 200 ?
Field Studies: None
Threats: Hunting, Loss of habitat because of exotic/domestic animals
Comments:
Recommendations:
Research management: Taxonomic and morphological genetic studies, Survey
PHVA: Yes
Other:
Captive Population: 4+ (San Diego and possibly additional captive animals in the Sudan)
Captive Program Recommendation: Increase captive program with the goal of achieving the 90/100 level of management within next 3 years.

SPECIES: *Capra aegagrus chialtanensis*
STATUS:
Mace-Lande: Critical/Endangered
CITES:
IUCN:
Other
Taxonomic status:
Distribution: Pakistan, North of Quetta, Baluchistan, Pakistan
Wild Population: < 500 - one population - decreasing?
Field Studies: Schaller, 1971
Threats: Poaching, Interspecific competition from exotics
Comments:
Recommendations:
Research management: Limiting factors management, Taxonomic and morphological genetic studies, Survey
PHVA: Yes
Other:
Captive Population: None
Captive Program Recommendation: Pending taxonomy

SPECIES: *Capra nubiana nubiana*
STATUS:

Mace-Lande: Critical/Endangered
CITES: not listed
IUCN: not listed
Other Sudan - schedule 2 species, 3 protected areas.
Ethiopia - can be hunted, Egypt - protected by law
in 4 areas). One protected area in Ethiopia.
Arabian population: listed on separate sheet.

Taxonomic status: Needs verification. Possibly 2 sub-populations:
Sub-population 1 - Arabian peninsula, Sub-population 2 - Africa.
Distribution: Egypt (except Sinai), Ethiopia - suspected in Northeast; Sudan.
Wild Population: Status unknown in Africa. Probably declining in Egypt, elsewhere? No surveys made. Guess = 200 - 1,000 (3 countries).
Field Studies: No current field studies. Perhaps a study in Egypt - unknown.
Threats: Hunting, Loss of habitat, Loss of habitat because of exotic/domestic animals, Drought (lack of waterholes).
Comments: Status of African vs. Arabian needs to be clarified.
Recommendations:

Research management: Surveys, taxonomy, (DNA work) Limiting factor management, Life history studies.
PHVA: Yes
Other:

Captive Population: Giza Zoo has a captive population with no plans for reintroduction. Two in Khartoum Zoological Garden, 6 in Medane Zoo Park.
Less than 50 of African population, Munich, Budapest, Khartoum and Egypt.
Captive Program Recommendation: Yes, pending taxonomy

SPECIES: *Capra walia*
STATUS:

Mace-Lande: Critical/Endangered
CITES: not listed
IUCN: Endangered
Other:

Taxonomic status:
Distribution: Ethiopia (Simen Mts)
Wild Population: <400?
Field Studies: At least 2.
Threats: Poaching, Loss of habitat, Interspecific competition, Interspecific competition from exotics
Comments:
Recommendations:

Research management: Surveys, Habitat management
PHVA: Yes
Other:

Captive Population:
Captive Program Recommendation: Pending

SPECIES: *Capra pyrenaica pyrenaica*
STATUS:
Mace-Lande: Critical
CITES:
IUCN: Endangered
Other
Taxonomic status:
Distribution: Northern Spain
Wild Population: 10
Field Studies: Yes?
Threats: Genetic problems?, Interspecific competition, Interspecific competition from exotics, Poaching
Comments:
Recommendations:
Research management: Limiting factors research
PHVA: Yes
Other:
Captive Population: None
Captive Program Recommendation: Pending

SPECIES: *Ovis vignei vignei*
STATUS:
Mace-Lande: Critical/Endangered
CITES:
IUCN:
Other: Threatened species by government of India - fully protected in Jammu and Kashmir
Taxonomic status:
Distribution: Northeast Pakistan, Northwest India, upper reaches of Indus River.
Wild Population: < 2,000 - more than 2 subpopulations
Field Studies:
Threats: Poaching, Interspecific competition from exotics
Comments: Readily accessible area, by roads
Recommendations:
Research management: Survey, Limiting factors management
PHVA: Yes - combined with Markhor
Other:
Captive Population: None
Captive Program Recommendation: Initiate a captive program immediately, within next 3 years, that is a nucleus of 50-100 individuals.

SPECIES: *Ovis ammon bochariensis*
STATUS:

Mace-Lande: Critical/Endangered
CITES: II
IUCN:
Other: Category I USSR Red Data Book

Taxonomic status:
Distribution:
Wild Population: 1,000 fragmented
Field Studies:
Threats: Poaching, Interspecific competition from exotics, Drought
Comments:
Recommendations:

Research management: Survey, Limiting factors management
PHVA: No
Other:

Captive Population: 0? Unknown at this time.
Captive Program Recommendation: Initiate a captive program immediately, within next 3 years, that is a nucleus of 50-100 individuals?

SPECIES: *Ovis ammon nigrimontana*
STATUS:

Mace-Lande: Critical
CITES: II
IUCN: not listed
Other: USFWS - endangered

Taxonomic status: the validity as a distinctive subspecies is not in doubt
Distribution: Kasachstan
Wild Population: 250 ?
Field Studies:
Threats: Poaching, Competition with livestock
Comments:
Recommendations:

Research management: Survey, Limiting factors management
PHVA:
Other:

Captive Population: 0 ?
Captive Program Recommendation: Initiate a captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Capricornis sumatraensis sumatraensis*
STATUS:

Mace-Lande: Endangered
CITES: I
IUCN: Endangered
Other: Endangered Species Act, protected under Malaysian Law

Taxonomic status:
Distribution: Sumatra and Peninsula of Malaysia
Wild Population: < 1,500
Field Studies: Yes, limited
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments: Attempted capture should be limited to young individuals as adults appear to be difficult to climatize. Captive individuals should be kept under conditions were are stress levels are kept at the lowest possible level and care should be taken to make sure the animals are kept free of parasites. Housing - preferably heavily planted enclosures which provide cover for these highly sensitive animals.
Recommendations:

Research management: Taxonomic and morphological genetic studies, Survey, Habitat managemment
PHVA: Yes
Other:

Captive Population: 12 - 15 (Jakarta, Kuala lumpur)
Captive Program Recommendation: Increase captive program, with the goal of developing a nucleus of 50-100 individuals.

SPECIES: *Capricornis sumatraensis maritimus*
STATUS:

Mace-Lande: Endangered
CITES: I
IUCN:
Other: Protected in Thailand, listed in Vietnam as a class II animal but nontheless hunted and captured.

Taxonomic status:
Distribution: Thailand, Laos, Vietnam, Burma
Wild Population: 2,000?
Field Studies: None
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments: See Capricornis sumartaensis sumatraensis
Recommendations:

Research management: Taxonomic and morphological genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: 8 - 10 (Bangkok, Chiang Mai)
Captive Program Recommendation: Increase captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Capricornis sumatraensis rubidus*
STATUS:

Mace-Lande: Endangered
CITES: I
IUCN:
Other: Protected under Indian Law in Assam

Taxonomic status:
Distribution: Burma, Bangladesh, Assam, India
Wild Population: < 2,500
Field Studies: None known
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments: See Capricornis sumatraensis sumatraensis
Recommendations:

Research management: Taxonomic and morphological genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: 4 - 5? in Gauhati
Captive Program Recommendation: Increase captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Nemorhaedus baileyi baileyi*
STATUS:

Mace-Lande: Endangered
CITES: I
IUCN: Vulnerable
Other: Class I protected in China

Taxonomic status:
Distribution: S.E. Tibet
Wild Population: < 2,000
Field Studies: Not in progress. Survey done approx. 10 yrs. ago by Director of Shanghai Zoo.
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments: Taxonomy questionable. May be synonymous with cranbrooki.
Probably advisable to house gorals in multi-level exhibits. As with serows, care should be taken to eliminate parasites. Juvenile males should be removed before one year of age. Advisable not to house in groups larger than a pair. Unwise to keep in mixed exhibits.
Recommendations:

Research management: Taxonomic and morphological genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: 15 - 20 2 males in Rotterdam, remaining animals in Chinese zoos, principally Shanghai.
Captive Program Recommendation: Increase captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Nemorhaedus baileyi cranbrooki*
STATUS:

Mace-Lande: Endangered
CITES: I
IUCN: Vulnerable
Other: Protected under Indian law, effectiveness is questionable.

Taxonomic status:
Distribution: Assam & upper Burma
Wild Population: < 2,000
Field Studies: None
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments: See baileyi
Recommendations:

Research management: Taxonomic and morphological genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: None
Captive Program Recommendation: Initiate a captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Nemorhaedus caudatus caudatus*
STATUS:

Mace-Lande: Endangered
CITES: I
IUCN:
Other: Class II protected species in China, protected in Russia. No data for Korea.

Taxonomic status: Lumped with raddeanus, Russian population not larger than 600 animals.
Distribution: Heilongjiang, N.E. China, N. & S. Korea, Russian Far East (Amur).
Wild Population: < 2,000
Field Studies: One on-going by the Russians.
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments:
Recommendations:

Research management: Taxonomic and morphological genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: 10+ in Pyongyang, Moscow, Tallinn
Captive Program Recommendation: Increase captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Nemorhaedus caudatus evansi*
STATUS:

Mace-Lande: Endangered
CITES:
IUCN:
Other

Taxonomic status: May be the same as griseus.
Distribution: Burma & Thailand
Wild Population: < 2,000 - three + populations
Field Studies: One done in the late 1980's.
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments: Same as for all gorals. This may be con-subspecific with griseus.
Recommendations:

Research management: Taxonomic and morphological genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: None
Captive Program Recommendation: Initiate a captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Rupicapra rupicapra tatrica*
STATUS:

Mace-Lande: Endangered
CITES:
IUCN: Rare
Other: Rare in the former Czechoslovakian Red Data Book. Protected by law in Poland.

Taxonomic status:
Distribution: In the mountains bordering Slovakia and Poland - Tatra Mtns.
Wild Population: < 1,000
Field Studies: No
Threats: Poaching, Hunting, hybridization, Human interference or disturbance
Comments: Same as cartusiana. Threatened through the introduction of Alpine Chamois.
Recommendations:

Research management: Taxonomic and morphological genetic studies, Habitat management
PHVA: Yes
Other:

Captive Population: None
Captive Program Recommendation: Initiate a captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Rupicapra pyrenaica ornata*
STATUS:

Mace-Lande: Endangered
CITES: I
IUCN: Vulnerable
Other: Endangered Species Act, special protection under Italian Law.

Taxonomic status:
Distribution: Apennines, of Abruzzo, Italy
Wild Population: < 500
Field Studies: Not on-going. Many in the last ten years.
Threats: Loss of habitat because of exotic/domestic animals
Comments:
Recommendations:

Research management: Taxonomic and morphological genetic studies
PHVA: Yes
Other:

Captive Population: 20 (two breeding groups in Abruzzo, Italy).
Captive Program Recommendation: Increase captive program with the goal of developing a nucleus of 50-100 individuals.

SPECIES: *Budorcas taxicolor bedfordi*
STATUS:

Mace-Lande: Endangered
CITES:
IUCN: Rare
Other: Class I protected list of China

Taxonomic status:
Distribution: Qinling Mountains, Shaanxi
Wild Population: 1,200
Field Studies: None
Threats: Hunting, Loss of habitat
Comments:
Recommendations:

Research management: Habitat management
PHVA: Yes
Other:

Captive Population: 20 in Chinese zoos and two in Japan.
Captive Program Recommendation: Increase a captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Ammotragus lervia sahariensis*
STATUS:
Mace-Lande: Endangered
CITES: II
IUCN: Vulnerable
Other:
Taxonomic status:
Distribution: Chad, Ahaggar, Tibesti, Tassili n'Azdjer
Wild Population: < 2,500
Field Studies: None
Threats: Hunting, Loss of habitat because of exotic/domestic animals
Comments: The Barbary Sheep in Almeria, Spain do not appear to be *sahariensis* since the founding stock was captured many thousands of kilometers west of the known range of *sahariensis*. Their taxonomic status needs to be clarified.
Recommendations:
Research management: Taxonomic and morphological genetic studies, Survey
PHVA: Yes
Other:
Captive Population: 160 (Almeria, Spain)
Captive Program Recommendation: Increased captive program with a goal of a 90/100 level of management within 3 years.

SPECIES: *Pseudois schaeferi*
STATUS:
Mace-Lande: Endangered/Critical
CITES:
IUCN:
Other:
Taxonomic status: Taxonomy questionable.
Distribution: The upper Yangtze River near Batang, Southern Tibet
Wild Population: < 2,500
Field Studies: Chinese have done a preliminary study - possibly.
Threats: Hunting
Comments:
Recommendations:
Research management: Taxonomic and morphological genetic studies
PHVA: Yes
Other:
Captive Population: None
Captive Program Recommendation: Initiate a captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Hemitragus hylocrius*
STATUS:
Mace-Lande: Endangered
CITES:
IUCN: Vulnerable
Other: Legally protected in India.
Taxonomic status:
Distribution: Nilgiri hills and western Ghats.
Wild Population: < 2,500
Field Studies: Some recently completed.
Threats: Poaching, Loss of habitat, Human interference or disturbance
Comments: Only one population of significantly more than 100 animals exists. This is in Eraviculam National Park - 800 animals.
Recommendations:
Research management: Habitat management
PHVA: Yes
Other:
Captive Population: 30+ (US and Indian zoos)
Captive Program Recommendation: Increase captive program with a goal of a 90/100 level of management within 3 years.

SPECIES: *Hemitragus jayakari*
STATUS:
Mace-Lande: Endangered
CITES: I
IUCN: Endangered
Other: Protected in Oman
Taxonomic status:
Distribution: Northern Oman and the border with Abu Dhabi
Wild Population: 1,000
Field Studies: One completed 10 years ago.
Threats: Loss of habitat because of exotic/domestic animals
Comments:
Recommendations:
Research management: Survey
PHVA: Yes
Other:
Captive Population: 10+ in Muscat
Captive Program Recommendation: Increase captive program with a goal of a 90/100 level of management within 3 years.

SPECIES: *Capra falconeri megaceros*
STATUS:
Mace-Lande: Endangered/Critical
CITES: I
IUCN: Endangered
Other: Protected by law - Pakistan
Taxonomic status:
Distribution: Afghanistan (around Kabul) NW Pakistan
Wild Population: < 1,000 Pakistan and Afghanistan
Field Studies:
Threats: Hunting, Illegal hunting (poaching), Interspecific competition from exotics
Comments:
Recommendations:
Research management: Limiting factors management, Survey, Management
PHVA: Yes, combined
Other:
Captive Population: None
Captive Program Recommendation: Initiate a captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Capra falconeri heptneri*
STATUS:
Mace-Lande: Endangered/Critical
CITES: I
IUCN: Vulnerable
Other: Category I USSR Red Data Book and Category I Uzbek Red Data Book
Taxonomic status:
Distribution: Dashtidjum district, Tadjikistan, Uzbekistan
Wild Population: < 700 and decreasing
Field Studies:
Threats: Poaching, War?
Comments:
Recommendations:
Research management: Limiting factors management, Survey
PHVA: Yes
Other:
Captive Population: around 100
Captive Program Recommendation: Increase captive program immediately, within next 3 years, at the 90/100 level of management.

SPECIES: *Capra cylindricornis*
STATUS:
Mace-Lande: Endangered
CITES:
IUCN:
Other: Category 3 Georgian Red Data Book
Taxonomic status:
Distribution: Eastern 2/3 of Caucasus
Wild Population: < 15,000
Field Studies: Nothing due to war.
Threats: Illegal hunting (poaching), Interspecific competition from exotics, War
Comments:
Recommendations:
Research management: Survey, Monitoring, Limiting factors management
PHVA: No
Other:
Captive Population: < 10
Captive Program Recommendation: Increase captive program.

SPECIES: *Ovis vignei punjabiensis*
STATUS:
Mace-Lande: Endangered
CITES:
IUCN:
Other:
Taxonomic status:
Distribution: Northern Pakistan
Wild Population: < 1500 - fragmented
Field Studies:
Threats: Poaching, Interspecific competition from exotics, Disease
Comments:
Recommendations:
Research management: Survey, Limiting factors management
PHVA: No
Other:
Captive Population: None
Captive Program Recommendation: Initiate a captive program immediately, within next 3 years, that is a nucleus of 50-100 individuals?

SPECIES: *Ovis vignei severtzovi*
STATUS:
Mace-Lande: Endangered/Vulnerable
CITES:
IUCN:
Other: Category I USSR Red Data Book
Taxonomic status:
Distribution:
Wild Population: 1500?
Field Studies:
Threats: Poaching, Interspecific competition from exotics
Comments: Is there any armed conflict now or potential for future conflict?
Recommendations:
Research management: Survey, Limiting factors management
PHVA: No
Other:
Captive Population: Unknown number in captive herd in protected areas.
Captive Program Recommendation: Not currently recommended but may be reconsidered pending further results.

SPECIES: *Ovis ammon jubata*
STATUS:
Mace-Lande: Endangered
CITES: II
IUCN:
Other Class II (China), Endangered (USFW)
Taxonomic status:
Distribution: north and north west China
Wild Population: < 700
Field Studies:
Threats: Poaching
Comments:
Recommendations:
Research management: Taxonomic and morphological genetic studies, limiting factor management, Survey
PHVA: Yes (combined with other subspecies)
Other:
Captive Population: Pending survey
Captive Program Recommendation:

SPECIES: *Ovis canadensis cremnobates/weemsi* (Combined population).
STATUS:

Mace-Lande: Endangered
CITES: II
IUCN:
Other CA F&G

Taxonomic status: should be examined
Distribution: SW California and Baja California
Wild Population: <3000
Field Studies: CA F&G southern California
Threats: Poaching, Disease, Interspecific competition from exotics, Loss of habitat
Comments:
Recommendations:

Research management: Survey, Limiting factors management, Taxonomic and morphological genetic studies(?)
PHVA: Yes
Other: no

Captive Population: 10
Captive Program Recommendation: Increase captive program within 3 years, at the 90/100 level of management.

SPECIES: *Ovis canadensis mexicana*
STATUS:

Mace-Lande: Endangered/Critical
CITES: II
IUCN:
Other

Taxonomic status: ok
Distribution: N. Mexico, Sonoran Desert
Wild Population: <500
Field Studies: unknown
Threats: Disease, Poaching, Loss of habitat, Interspecific competition from exotics
Comments:
Recommendations:

Research management: Survey, Limiting factors management, Taxonomic and morphological genetic studies(?)
PHVA: Yes/combined
Other: none

Captive Population: 12
Captive Program Recommendation: Increase captive program immediately, within next 3 years

Table 8. Caprine taxa categorized as Vulnerable according to Mace-Lande Criteria.

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
4	*Capricornis*	*sumatraensis milneedwardsii*	S.Eastern China	<4,000?	2-3	20+?	D	F?	V	Hp,Lf	Y	T,S,H m	N-2		0
6	*Capricornis*	*sumatraensis thar*	Himalayas	<5,000?	2-3	20+?	D	E?	V	Hp,Lf	Y	T,S,H m	N-2		0
9	*Capricornis*	*crispus swinhoei*	Central Taiwan	<5,000?	2-3	2+	D	C?	V	Hp,Lf	Y	T,S,H m	N-2	8	15-20
16	*Nemorhaedus*	*caudatus griseus*	Sichuan, N.Yunan	<10,000?	2-3	10+?	D	E?	V	Hp,Lf	Y	T,S,H m	I-2	1	1
17	*Nemorhaedus*	*caudatus arnouxianus*	Central China	<10,000?	2-3	10+?	D	D?	V	Hp,Lf	Y	T,S,H m	N-2	19	40-50
19	*Nemorhaedus*	*goral goral*	Eastern Himalaya	<5,000?	2-3	10+?	D	D?	V	Hp,Lf	Y	T,S,H m	N-1		5-6
20	*Nemorhaedus*	*goral bedfordi*	Western Himalaya	<5,000?	2-3	10+?	D	D?	V	Hp,Lf	Y	T,S,H m	I-1		5
24	*Rupicapra*	*rupicapra asiatica*	Pontus chain, & Central, East Turkey	<10,000?	2-3	10+?	S?	E?	V	Hp,La	Y	T,S,H m	N-Pend		0
27	*Rupicapra*	*rupicapra caucasica*	Caucasus & Anti Caucasus	<10,000?	3	3+	D	C?	V	Hp,Ic	Y	Hm	N-Pend		0
29	*Rupicapra*	*rupicapra carpatica*	Carpathian Mts	<10,000	2	1	D	C	V	Hp	Y	Hm	N-Pend		0
31	*Rupicapra*	*pyrenaica pyrenaica*	Pyrenees	>20,000	1	1	S	C	V	Hp,La	Y	Lm	N-Pend		0
33	*Rupicapra*	*pyrenaica parva*	Cantabrian Mts	<10,000	1	3	I	C	V	Hp,La	Y	Lm	N-Pend		0

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
38	*Budorcas*	*taxicolor taxicolor, & whitei*	Assam, Bhutan	<10,000?	2,3	10+?	D	D?	V	Hp,L	Y	Hm,T	N-1	5	19
39	*Budorcas*	*taxicolor tibetanus*	Sichuan & Gansu	<5,000?	2,3	5+?	D	E?	V	Hp,L	Y	Hm	N-1	9	30
42	*Ammotragus*	*lervia lervia*	Tunisia to Mauritania	>3,000	2-4	20+	S	E	V	H,La	Y	T,S	N-Pend	2	0
46	*Ammotragus*	*lervia angusi*	Air region & Ifoghas, Niger	<5,000?	3-4	2	D	D?	V	H,La	Y	T,S	I-1	0	0
50	*Pseudois*	*nayaur szechuanensis*	Sheensi, China	>20,000?	2-4	20+?	D	G?	V	H,L	N	N	I-1	10	50+
60	*Capra*	*aegagrus turcmenica*	South Turkmenia, N.Iran	<2,500	3-4	3?	D	?	V	Hp,Ice,L	N	S,M	I-1		1
62	*Capra*	*falconeri falconeri*	Afganistan, Pakistan, Kashmir	<3,500	2-4	>5	D	C?	V/E	H,Hp,Ice	Y	Lm,S,H	N-Pend	0	0
67	*Capra*	*nubiana sinaitica*	Egypt (Sinai), Arabia, Israel, Jordan, Oman	2,000-5,000?	1-4	>10?	S?	C?	V	La,I,Hp,Ice	P	T,S,Lm	N0	155?	>100
76	*Capra*	*caucasica*	western 1/3 of Caucasus	<10,000	3	1?	D?	C?	V/E	Hp,Ice?,War	N	S,M,Lm	I-1	74	100±
83	*Ovis*	*gmelini ophion*	Cyprus	1,200	1-2	1	S	AA-2?	V	D	N	M	N-1		<100
85	*Ovis*	*vignei arkal*	E. Iran, Transcaspasian	>5,000?	4	>2?	S/D?	E?	V	Hp,Ice?	N	S,Lm	N-Pend		0
87	*Ovis*	*vignei cycloceros*	Afghanistan, Pakistan, Turkmenistan	<12,000?	3-4	>2?	D?	E?	V/S	Hp,Ice,L,P?	N	S,Lm	N-Pend	7	50
93	*Ovis*	*ammon ammon*	Mongolia, Kazakistan, China	<12,000?	2-4	>5?	D	?	V	Ice,H	Y	S,M,Lm	N-Pend	1	<10
94	*Ovis*	*ammon darwini*	Mongolia & China	<3,000?	3-4	>5?	D	?	V/E	Hp,Ice	Y	T,Lm,Sm	N-Pend		0

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
96	*Ovis*	*ammon hodgsoni*	Himalayas, Tibetan argali	5,000-20,000?	2-4	>10?	D?	?	V/E	Hp,L, Ice	Y	S,T,Lm	N-Pend		0?
97	*Ovis*	*ammon karelini*	Tien Shan Mts China	<10,000?	3-4	>5?	D	?	V/E	Hp,Ice,La	Y	T,S,Lm	N-Pend		0?
99	*Ovis*	*ammon polii*	Afganistan, Pakistan, Pamir China	<18,000?	2-4	>5?	D	?	V/E	Hp,La, Ice	Y	S,Lm	N-Pend	0	0?
112	*Ovis*	*nivicola borealis*	Putoran Mts N Central Siberia	<3,000	2-3	1?	S	?	V	Hp,Ice	N	S,Lm	N-1		10

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
96	*Ovis*	*ammon hodgsoni*	Himalayas, Tibetan argali	5,000-20,000?	2-4	>10?	D?	?	V/E	Hp,L, Ice	Y	S,T,Lm	N-Pend		0?
97	*Ovis*	*ammon karelini*	Tien Shan Mts China	<10,000?	3-4	>5?	D	?	V/E	Hp,Ice,La	Y	T,S,Lm	N-Pend		0?
99	*Ovis*	*ammon polii*	Afganistan, Pakistan, Pamir China	<18,000?	2-4	>5?	D	?	V/E	Hp,La, Ice	Y	S,Lm	N-Pend	0	0?
112	*Ovis*	*nivicola borealis*	Putoran Mts N Central Siberia	<3,000	2-3	1?	S	?	V	Hp,Ice	N	S,Lm	N-1		10

SPECIES: *Capricornis sumatraensis milneedwardsii*
STATUS:

Mace-Lande: Vulnerable
CITES: I
IUCN:
Other: Category II Chinese protected list

Taxonomic status:
Distribution: Gansu, E. Tibet, E. & W. Sichuan, SE China
Wild Population: < 4,000?
Field Studies: None
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments: See Capricornis sumatraensis sumatraensis
Recommendations:

Research management: Taxonomic, morphological and genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: None
Captive Program Recommendation: Initiate development of a nucleus population of 50-100 individuals, within 3 or more years, with the aim to represent as much of the wild gene pool as possible.

SPECIES: *Capricornis sumatraensis thar*
STATUS:

Mace-Lande: Vulnerable
CITES: I
IUCN:
Other: Protected by Buddhists in Bhutan, Category II Chinese protected list. Totally protected in India.

Taxonomic status:
Distribution: Nepal through Himalayas to Bhutan and S. Tibet, Burma
Wild Population: < 5,000
Field Studies: None
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments: See Capricornis sumatraensis sumatraensis
Recommendations:

Research management: Taxonomic, morphological and genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: None
Captive Program Recommendation: Initiate development of a nucleus population of 50-100 individuals, within 3 or more years, with the aim to represent as much of the wild gene pool as possible.

SPECIES: *Capricornis crispus swinhoei*
STATUS:

Mace-Lande: Vulnerable
CITES:
IUCN: Vulnerable
Other: Precious and rare, hunting prohibited under Taiwanese Law.

Taxonomic status:
Distribution: Central Taiwan
Wild Population: < 5,000
Field Studies: At least one on-going study.
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments:
Recommendations:

Research management: Taxonomic, morphological and genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: 15 - 20: Taipei, Japanese Serow Centre
Captive Program Recommendation: Increase captive population with the goal of development of a nucleus population of 50-100 individuals, within 3 or more years, with the aim to represent as much of the wild gene pool as possible.

SPECIES: *Nemorhaedus caudatus griseus*
STATUS:

Mace-Lande: Vulnerable
CITES: I
IUCN: Vulnerable
Other: Class II protected species in Chinese Law. Protected in Laos.

Taxonomic status:
Distribution: Sichuan, Yunnan, and bordering Northern Laos
Wild Population: < 10,000
Field Studies: None
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments:
Recommendations:

Research management: Taxonomic, morphological and genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: One in Singapore. Possibly one in Guangzhou
Captive Program Recommendation: Initiate development of a captive population managed at a 90/100 level within 3 or more years.

SPECIES: *Nemorhaedus caudatus arnouxianus*
STATUS:

Mace-Lande: Vulnerable
CITES: I
IUCN:
Other: Class II in China

Taxonomic status: Same as *baileyi*
Distribution: Hupei, Zhejiang, Central China
Wild Population: < 2,000
Field Studies: None
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments:
Recommendations:

Research management: Taxonomic, morphological and genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: 40 - 50 The common goral in Chinese zoos and 23 in US zoos.
Captive Program Recommendation: Increase captive population with the goal of developing nucleus population of 50-100 individuals, within 3 or more years, with the aim to represent as much of the wild gene pool as possible.

SPECIES: *Nemorhaedus goral goral*
STATUS:

Mace-Lande: Vulnerable
CITES: I
IUCN:
Other: Class II protected in China, legally protected in India, no information for Nepal.

Taxonomic status:
Distribution: Eastern Himalayas
Wild Population: < 5,000
Field Studies: Two on-going and three finished recently.
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments:
Recommendations:

Research management: Taxonomic, morphological and genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: 5 - 6 in Shimla, (Himachal Pradsh, India)
Captive Program Recommendation: Increase captive program toward a goal of managing a nucleus population of 50-100 individuals.

SPECIES: *Nemorhaedus goral bedfordi*
STATUS:

Mace-Lande: Vulnerable
CITES:
IUCN:
Other: Legally protected but not enforced satisfactorily in Pakistan.

Taxonomic status: Needs to be clarified. May be synonymous with *goral.*
Distribution: Western Himalaya (Pakistan, India)
Wild Population: < 5000
Field Studies: One, completed but probably will not be published.
Threats: Poaching, Loss and fragmentation of habitat because of deforestation
Comments:
Recommendations:

Research management: Taxonomic, morphological and genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: None
Captive Program Recommendation: Initiate a captive program toward a goal of managing the population at a 90/100 level.

SPECIES: *Rupicapra rupicapra asiatica*
STATUS:

Mace-Lande: Vulnerable
CITES:
IUCN:
Other: Protected by Turkish Law to some extent.

Taxonomic status:
Distribution: Pontus chain, Turkey. Possibly in the areas of Erzurum & Erzincan.
Wild Population: < 10,000
Field Studies: No
Threats: Poaching, Loss of habitat because of exotic/domestic animals
Comments: Exact survey of the range is imperative.
Recommendations:

Research management: Taxonomic, morphological and genetic studies, Survey, Habitat management
PHVA: Yes
Other:

Captive Population: None
Captive Program Recommendation: Not currently recommended but may be reconsidered pending further data

SPECIES: *Rupicapra rupicapra caucasica*
STATUS:
Mace-Lande: Vulnerable
CITES:
IUCN:
Other
Taxonomic status:
Distribution: In the Caucasus between 38 degrees and 48 degrees east longitude as well as in the Anti-Caucasus, west of Tbilisi, and in the mountains on the northern bank of lake Sewanga.
Wild Population: < 10,000
Field Studies: No
Threats: Poaching, Interspecific competition
Comments: Check taxonomic status.
Recommendations:
Research management: Habitat management
PHVA: Yes
Other:
Captive Population: None
Captive Program Recommendation: Not currently recommended but may be reconsidered pending further data

SPECIES: *Rupicapra rupicapra carpatica*
STATUS:
Mace-Lande: Vulnerable
CITES:
IUCN:
Other
Taxonomic status:
Distribution: Carpathian Mts. - Rumania
Wild Population: < 10,000
Field Studies: No
Threats: Poaching
Comments:
Recommendations:
Research management: Habitat management
PHVA: Yes
Other:
Captive Population: None
Captive Program Recommendation: Not currently recommended but may be reconsidered pending further data

SPECIES: *Rupicapra pyrenaica pyrenaica*
STATUS:
Mace-Lande: Vulnerable
CITES:
IUCN:
Other:
Taxonomic status:
Distribution: Pyrenean from Pic d'Arlas in the West to Prats de Mollos in the East.
Wild Population: < 20,000
Field Studies: Several recent studies completed, not aware of any on-going.
Threats: Poaching, Loss of habitat because of exotic/domestic animals
Comments:
Recommendations:
Research management: Limiting factors management
PHVA: Yes
Other:
Captive Population: None
Captive Program Recommendation: Not currently recommended but may be reconsidered pending further data

SPECIES: *Rupicapra pyrenaica parva*
STATUS:
Mace-Lande: Vulnerable
CITES:
IUCN:
Other:
Taxonomic status:
Distribution: Cantabrian Mts. Spain. Particularily in and around Covadonga National Park in the Picos de Europas and in the Mts. of Pena Ubina.
Wild Population: < 10,000
Field Studies: Some recently completed.
Threats: Poaching, Loss of habitat because of exotic/domestic animals
Comments:
Recommendations:
Research management: Limiting factors management
PHVA: Yes
Other:
Captive Population: None
Captive Program Recommendation: Not currently recommended but may be reconsidered pending further data

SPECIES: *Budorcas taxicolor taxicolor & whitei*
STATUS:
Mace-Lande: Vulnerable
CITES: II
IUCN:
Other: Class I in China, protected in Bhutan, in India
Taxonomic status: Validity of whitei questionable.
Distribution: Bhutan, Assam, No. Burma to Northern Yunnan.
Wild Population: < 10,000
Field Studies: No
Threats: Poaching, Loss of habitat
Comments:
Recommendations:
Research management: Habitat management, taxonomic and morphological genetic studies
PHVA: Yes
Other:
Captive Population: 19 distributed (10 in Tierpark Berlin, 2 in Wuppertal, 1 on Rotterdam, 2 in San Diego, 1 in Shanghai, 3 in Rangoon.
Captive Program Recommendation: Increase captive program with the goal of managing a nucleus population of 50-100 individuals representing as much of the wild gene pool as possible.

SPECIES: *Budorcas taxicolor tibetana*
STATUS:
Mace-Lande: Vulnerable
CITES: II
IUCN: I
Other: Class I in protected animals in China
Taxonomic status:
Distribution: So. Gansu and Sichuan
Wild Population: < 5,000
Field Studies:
Threats: Poaching, Loss of habitat
Comments:
Recommendations:
Research management: Habitat management
PHVA: Yes
Other:
Captive Population: 30 (9 in US, remainder in China and Japan)
Captive Program Recommendation: Increase captive program with the goal of managing a nucleus population of 50-100 individuals representing as much of the wild gene pool as possible.

SPECIES: *Ammotragus lervia lervia*
STATUS:

Mace-Lande: Vulnerable
CITES: II
IUCN: Vulnerable
Other: Protected in Algeria, partially protected in Mauritania, completely protected in Morocco. Protected in Tunisia.

Taxonomic status:
Distribution: Originally from Tunisia through Algeria and Morocco, south to Mauritania. It has been exterminated over a wide portion of its original range.
Wild Population: > 3,000
Field Studies: Yes, in Algeria
Threats: Hunting, Loss of habitat because of exotic/domestic animals
Comments: Most of the captive populations of A. lervia are probably of subspecific hybrid origin.
Recommendations:

Research management: Taxonomic, morphological and genetic studies, Survey
PHVA: Yes
Other:

Captive Population: None
Captive Program Recommendation: Not currently recommended but may be reconsidered pending further data

SPECIES: *Ammotragus lervia angusi*
STATUS:

Mace-Lande: Vulnerable
CITES: II
IUCN: Vulnerable
Other: Protected on paper in Niger.

Taxonomic status:
Distribution: Air region & Ifoghas, Niger
Wild Population: < 5,000
Field Studies: No
Threats: Hunting, Loss of habitat because of exotic/domestic animals
Comments:
Recommendations:

Research management: Taxonomic, morphological and genetic studies, Survey
PHVA: Yes
Other:

Captive Population: None
Captive Program Recommendation: Initiate development of a captive population managed at a 90/100 level within 0-3 years.

SPECIES: *Pseudois nayaur szechuanensis*
STATUS:
Mace-Lande: Vulnerable
CITES:
IUCN:
Other:
Taxonomic status:
Distribution: Sichuan North to Western Mongolia
Wild Population: > 20,000
Field Studies: No
Threats: Hunting, Loss of habitat
Comments: The population is probably fragmented throughout the range which could result in regional extermination.
Recommendations:
Research management: None
PHVA: No
Other:
Captive Population: 50+ (Common in Chinese zoos, Tierpark Berlin, Paris, Mulhouse, Rotterdam, San Diego
Captive Program Recommendation: Increase captive program with the goal of managing at a 90/100 level within 3 years.

SPECIES: *Capra aegagrus turcmenica*
STATUS:
Mace-Lande: Vulnerable
CITES:
IUCN:
Other: Class II USSR Red Data Book
Taxonomic status:
Distribution: Kopet Dag, Big Balkhan, Little Balkhan (verging on extinction in 1984)
Wild Population: < 2500 - unknown - 3 sub-populations - declining
Field Studies: Unlikely
Threats: Poaching, Interspecific competition from exotics, Loss of habitat
Comments:
Recommendations:
Research management: Survey, Limiting factors management
PHVA: No
Other:
Captive Population: One male
Captive Program Recommendation: Initiate development of a captive population managed at a 90/100 level within 0-3 years.

SPECIES: *Capra falconeri falconeri*
STATUS:
Mace-Lande: Vulnerable/Endangered
CITES: I
IUCN: Vulnerable
Other: Legal Protection in India and Pakistan
Taxonomic status:
Distribution: Afghanistan, Nuristan, and Laghman, Northern Pakistan
Wild Population: < 3,500
Field Studies: None known
Threats: Hunting, Poaching, Interspecific competition from exotics
Comments:
Recommendations:
Research management: Limiting factors management, Survey, Monitoring
PHVA: Yes
Other:
Captive Population: None
Captive Program Recommendation: Pending PVA

SPECIES: *Capra nubiana sinaitica*
STATUS:
Mace-Lande: Vulnerable
CITES:
IUCN:
Other
Taxonomic status:
Distribution: Israel, Oman, Egypt, (Sinai), Saudi Arabia, Yemen, Jordan.
Wild Population: Israel, 1500 (survey 1987) - stable, Jordan - previously declined, now stable, Lebanon - extinct, Oman - stable? unknown, Saudi Arabia - within protected areas increasing outside of protected areas decreasing, Syria - extinct, Yemen - no data. Egypt (Sinai) - about 400 in 1979. Total population 2,000-5,000. Questionable scattered sub-populations (anecdotal).
Field Studies: Israel ongoing, also Saudi Arabia.
Threats: Poaching, Loss of habitat because of exotic/domestic animals, Human interference or disturbance, Interspecific competition from exotics
Comments: Lebanon wishes to develop reintroduction program.
Recommendations:
Research management: Survey, Taxonomic, morphological and genetic studies, Limiting factors research, Limiting factors management
PHVA: Pending
Other:
Captive Population: > 100 Significant pop. in NA is a mix of both.
Captive Program Recommendation: No.

SPECIES: *Capra caucasica*
STATUS:

Mace-Lande: Vulnerable/Endangered
CITES:
IUCN:
Other: Rare in Karachai-Circassia Red Data Book (1988)

Taxonomic status:
Distribution: Western 1/3 of Caucasus
Wild Population: < 10,000
Field Studies: Impossible because of war
Threats: Poaching, Interspecific competition from exotics?, War
Comments:
Recommendations:

Research management: Impractical at the moment but as soon as possible do a survey start population monitoring and Limiting factors management, Survey, Monitoring
PHVA: No
Other:

Captive Population: around 100
Captive Program Recommendation: Increase captive program within next 3 years, at the 90/100 level of management.

SPECIES: *Ovis gmelini ophion*
STATUS:
Mace-Lande: Vulnerable
CITES:
IUCN: Vulnerable
Other: Cypress game laws full protection
Taxonomic status:
Distribution: Cypress
Wild Population: around 1200
Field Studies:
Threats: Disease
Comments: Questionable origin of ancestors
Recommendations:
Research management: Monitoring
PHVA: No
Other:
Captive Population: Two groups on Cyprus - < 100
Captive Program Recommendation: Increase captive program with the goal of managing a nucleus population of 50-100 individuals representing as much of the wild gene pool as possible.

SPECIES: *Ovis vignei arkal*
STATUS:
Mace-Lande: Vulnerable
CITES:
IUCN:
Other: Category II USSR Red Data Book
Taxonomic status:
Distribution: Eastern Iran, Transcaspian - more than 2 sub-populations
Wild Population: 5,000+?, sub-population - more than 2
Field Studies:
Threats: Poaching, Interspecific competition from exotics?
Comments:
Recommendations:
Research management: Survey, Limiting factors management
PHVA: No
Other:
Captive Population: None
Captive Program Recommendation: Not currently recommended but may be reconsidered pending further data

SPECIES: *Ovis vignei cycloceros*
STATUS:
Mace-Lande: Vulnerable/Safe
CITES:
IUCN:
Other: Category II USSR Red Data Book
Taxonomic status:
Distribution: Afghanistan, Pakistan, and Turkmenistan
Wild Population: < 12,000
Field Studies:
Threats: Poaching, Interspecific competition from exotics, Loss of habitat, Predation?
Comments:
Recommendations:
Research management: Survey, Limiting factors management
PHVA: NO
Other:
Captive Population: 50
Captive Program Recommendation: Not currently recommended but may be reconsidered pending further data

SPECIES: *Ovis ammon ammon*
STATUS:
Mace-Lande: Vulnerable in terms of total population (critical in C.I.S. and China)
CITES: II
IUCN:
Other Vulnerable (Mongolian Red Book), Category I (USSR Red Book), Class II (China) Endangered (USFW)
Taxonomic status:
Distribution: Mongolia, Gorno-Altai, China (Altai)
Wild Population: < 12000 (most, +/- 10000 in Mongolia)
Field Studies: ? Mongolia
Threats: Poaching, Hunting, Competition from domestic livestock
Comments: Some of the animals estimated for Mongolia may be darwini. In Gorno-Altas, Russia, there are probably only 50 animals in 5 scattered groups that are not interconnected.
Recommendations:
Research management: Limiting factors management, Monitoring
PHVA: Yes, in Mongolia (and - if possible - involving wildlife managers from Mongolia, Russia and China)
Other:
Captive Population: < 10
Captive Program Recommendation: pending survey

SPECIES: *Ovis ammon darwini*
STATUS:
Mace-Lande: Vulnerable/Endangered
CITES: II
IUCN:
Other Class II (China), Endangered (USFW)
Taxonomic status:
Distribution: Mongolia, China
Wild Population: < 3000
Field Studies:
Threats: Poaching, Competition with livestock
Comments:
Recommendations:
Research management: Taxonomy, Survey, Monitoring, Limiting factors management
PHVA: Yes (combined with ammon)
Other:
Captive Population: 0
Captive Program Recommendation: Pending survey and taxonomy

SPECIES: *Ovis ammon hodgsoni*
STATUS:
Mace-Lande: Vulnerable/Endangered
CITES: I
IUCN:
Other Class II (China), Endangered (USFW)
Taxonomic status: some taxonomists divide this into three subspecies (*hodgsoni, dalai-lamae, adametzi*)
Distribution: mountains surrounding the Tibetian plateau (China, India, Nepal, Bhutan ?)
Wild Population: 5000 - 20000
Field Studies: Joe Fox in India (91/92) - some in China
Threats: Poaching, Competition with livestock, Habitat loss
Comments:
Recommendations:
Research management: Survey, Taxonomy, Limiting factors management
PHVA: Yes (combined with other subspecies)
Other:
Captive Population: 0 ?
Captive Program Recommendation: Not currently recommended but may be reconsidered pending further data

SPECIES: *Ovis ammon karelini*
STATUS:
Mace-Lande: Vulnerable/Endangered
CITES: II
IUCN:
Other: Endangered (USFWS)
Taxonomic status: some taxonomists divide this into three subspecies (*karelini, littledalei, sairensis*)
Distribution: Tien Shan mountains (Kirgizia, China)
Wild Population: < 10,000
Field Studies:
Threats: Poaching, competition with livestock
Comments:
Recommendations:
Research management: Taxonomy, Survey, Limiting factors management
PHVA: Yes (combined)
Other:
Captive Population: None
Captive Program Recommendation: pending

SPECIES: *Ovis ammon polii*
STATUS:
Mace-Lande: Vulnerable/Endangered
CITES: II
IUCN:
Other: Class II (China), Endangered (USFWS)
Taxonomic status: well established (may integrade with karelini in the north)
Distribution: Tadjikistan, Afghanistan, Pakistan, China
Wild Population: < 18000 (most of them in Tadzikistan)
Field Studies:
Threats: Poaching, competition from livestock, habitat loss due to overgrazing, Karakorum highway a major contributor to decline due to access
Comments: Trophy in Tadzikistan still ongoing
Recommendations:
Research management: Survey, Limiting factors management
PHVA:
Other:
Captive Population: 0 ?
Captive Program Recommendation: pending

SPECIES: *Ovis nivicola borealis*
STATUS:
Mace-Lande: Vulnerable
CITES:
IUCN:
Other: Category III USSR Red Data Book
Taxonomic status: ok
Distribution: North Central Siberia, Putorean Mountains
Wild Population: <3000
Field Studies: ?
Threats: Poaching, Interspecific competition from exotics
Comments:
Recommendations:
Research management: Survey, Limiting factors management
PHVA: no
Other: no
Captive Population: 10
Captive Program Recommendation: Increase captive program.

Table 9. Caprine taxa categorized as Safe according to Mace-Lande Criteria.

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M /L	THRTS	PVA	RSCH	REC	ISIS	
8	*Capricornis*	*crispus crispus*	Kyushu, Honshu Shikoku Isl	100,000	1-2	30+	S	E	S				NO	6	65+
21	*Oreamnos*	*americanus*	Alaska to Washington, E to Yukon	>10,000	1-2	50+	I	G	S	NONE	N	NONE	NO	116	100+
23	*Rupicapra*	*rupicapra rupicapra*	Alpine Arch	>200,000	1-2	12+	I	G	S	NONE	N	NONE	NO	35	200-300
25	*Rupicapra*	*rupicapra balcanica*	Balkans	>20,000	1-2	20+	I	E	S	Hyb	Y	T*	N-Pend		0
35	*Ovibos*	*moschatus moschatus*	Alaska, Canada	>10,000	1	100+	I	G?	S	NONE	N	NONE	N-Pend	12	50+
36	*Ovibos*	*moschatus wardi*	Greenland	>10,000	1	100+	I	G?	S	NONE	N	NONE	N-Pend	35	+above
49	*Pseudois*	*nayaur nayaur*	Himalayas & Tibet	>20,000?	2-4	20+?	S	G?	S	N	N	N	N-Pend		?
56	*Capra*	*aegagrus aegagrus*		1,000+	2-4	>5	D	?	S	Hp,Ice, L	N	M	NO	4	?
57	*Capra*	*aegagrus cretica*		<600	1-2	2	I-	?	S/V	Hyb,Hp, I	N	T,M	N-Pend	6	150
65	*Capra*	*ibex ibex*	Alpine ibex	>30,000	1-2	>10	I	D?	S	NONE	N	N	N0	77	>300
70	*Capra*	*(ibex) sibirica*	Russia, Mongolia, Tadjikistan, Kasmir	>200,000	2-4	>10	S?	E?	S	Hp,La	N	Lm,T	NO	73	>200
79	*Ovis*	*gmelini gmelini*	Turkey, W.Iran, & S. Armenia	>6,000?	3-4	>24	D+?	E?	S/V	Hp,Ice	N	S,Lm	N-Pend	40	100

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M /L	THRTS	PVA	RSCH	REC	ISIS	
82	*Ovis*	*gmelini musimon*	Sardinia & Corsica	<3,000	1-2	2	S	AA?	S/ V	Hp	N	M	N-Pend		>500
102	*Ovis*	*canadensis canadensis*	West Mts N America	15,000+	1-2	20+	S	?	S	D	N	M	NO	97	120
103	*Ovis*	*canadensis californiana*	Dry mts W of Rockies	4,000+	1-2	5	S/I	?	S	D	N	M	NO	13	20
106	*Ovis*	*canadensis nelsoni*	Western arid Mts of USA	>15,000	1-2	>10	S	?	S/ V	D,Ice	N	M	I-1	10	12
108	*Ovis*	*dalli dalli*	Alaska, NWT Brit Columbia, Yukon	>15,000	1-2	5+	S	?	S	NONE	N	M	N-1	121	120
109	*Ovis*	*dalli stonei*	N Brit. Colum., Yukon	>10,000	1-2	5+	S	?	S	NONE	N	M	N-1	2	10+
111	*Ovis*	*nivicola nivicola*	Kamchatka Peninsula	5,000-12,000	2	2+	S	?	S	Hp,Ice, H	N	S,Lm	N-1	2	15+
113	*Ovis*	*nivicola lydekkeri*	Yakut sheep E. & NE Siberia	4,000-8,000?	2-3	>5?	S	?	S	Hp,Ice	N	S,Lm	N-Pend		0
52	*Hemitragus*	*jemlahicus*	(includes New Zealand), Kashmir to Sikkim	<30,000	2-4	10+	S	E	S?	Lf	N	T	N-Pend	217	250+
58	*Capra*	*aeegagrus blythi*	Pakistan, Iran,	<5,000?	3-4	>10?	S/D	E?	S?	Ice,Hp	N	S,Lm, T	NO	50?	0
73	*Capra*	*pyrenaica hispanica*	SE Spain	8,000	1	6	S	C?	S?	None?	N	M	NO	4	5
74	*Capra*	*pyrenaica victoriae*	C. Spain	3,300	1	1	S	B?	S?	?	N	M	NO		0
100	*Ovis*	*ammon collium*	NE Kazakhstan	8,000-10,000?	3-4	?	I?	?	S?	Hp,La, Ice	Y	S,Lm	N-Pend		0?

TAXON REPORTS FOR SAFE TAXA.

SPECIES: *Capricornis crispus crispus*
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other: 1935 declared a National Monument in Japan.
Taxonomic status:
Distribution: Honshu, Shikoku, Kyushu
Wild Population: 100,000
Field Studies: There are several ongoing field studies in Japan.
Threats:
Comments: There has been a push to open a hunting season for crispus due to their damage to young conifer plantations. Feeding and diet appears to be a problem with captive individuals outside of Japan.
Recommendations:
Research management:
PHVA:
Other:
Captive Population: 65+ principally in Japan as of 1990.
Captive Program Recommendation:

SPECIES: *Oreamnos americanus*
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other
Taxonomic status:
Distribution: Alaska South to Washington. East through the Yukon, to the Black Hills - were introduced in 1924 (on the border between Wyoming and South Dakota).
Wild Population: > 10,000
Field Studies: Many
Threats: None
Comments: Do not mix with other ungulates.
Recommendations:
Research management:
PHVA: No
Other:
Captive Population: 100 Europe, Asia and North America
Captive Program Recommendation: Not currently recommended

SPECIES: *Rupicapra rupicapra rupicapra*
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other:
Taxonomic status:
Distribution: Whole Alpine arch, introduced in New Zealand, Argentina, Balkans and in the Chartreuse Alps. 12+ populations.
Wild Population: > 200,000
Field Studies: Many completed and some in progress.
Threats:
Comments:
Recommendations:
Research management:
PHVA: No
Other:
Captive Population: 200 - 300
Captive Program Recommendation: Not currently recommended

SPECIES: *Rupicapra rupicapra balcanica*
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other
Taxonomic status:
Distribution: Balkans
Wild Population: > 20,000
Field Studies: No
Threats: Hybridization
Comments: Alpine Chamois should not be introduced into the range of this subspecies.
Recommendations:
Research management: Taxonomic, morphological and genetic studies
PHVA: Yes
Other:
Captive Population: None
Captive Program Recommendation: Pending

SPECIES: *Ovibos moschatus moschatus*
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other:
Taxonomic status:
Distribution: From Cape Barrow, Northern Alaska, west across the barren grounds to the west coast of Hudson Bay and from there south to the Churchill River,
Wild Population: > 10,000
Field Studies:
Threats:
Comments: *Ovibos* has been reintroduced into the Russian Artic.
Recommendations:
Research management:
PHVA: No
Other:
Captive Population: 50+ for both moschatus and wardi. In Europe, North America and Asia.
Captive Program Recommendation: Not currently recommended

SPECIES: *Ovibos moschatus wardi*
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other:
Taxonomic status:
Distribution: From Banks and Victoria Islands in the Canadian Artic Ocean to western, northern and eastern coast of Greenland. Introduced into Spitzbergen and Norway in 1938 from where it has wondered across the border into Sweden.
Wild Population: > 10,000
Field Studies: Ongoing
Threats:
Comments:
Recommendations:
Research management:
PHVA: No
Other:
Captive Population: 50+ (combined with *O. m. moschatus*) in Europe, North America, Asia
Captive Program Recommendation: Pending

SPECIES: *Pseudois nayaur nayaur*
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other:
Taxonomic status:
Distribution: Pakistan (along the Himalayas) to S. Eastern Tibet
Wild Population: > 20,000
Field Studies: Several completed in last 20 years.
Threats:
Comments:
Recommendations:
Research management:
PHVA:
Other:
Captive Population: Unknown at this time.
Captive Program Recommendation: Pending

SPECIES: *Capra aegagrus aegagrus*
STATUS:
Mace-Lande: Safe - see comments
CITES:
IUCN:
Other: Category II Red Data Book of USSR, Georgia and Russia
Taxonomic status:
Distribution: West Iran, Georgia, Azerbiajan
Wild Population: > 12,000 - more than 5 subpopulations
Field Studies:
Threats: Poaching, Interspecific competition from exotics, Loss of habitat
Comments:
Recommendations:
Research management: Monitoring
PHVA: No
Other:
Captive Population: ? Unknown at this time.
Captive Program Recommendation: Not currently recommended

SPECIES: *Capra aegagrus cretica*
STATUS:
Mace-Lande: Safe/Vulnerable
CITES:
IUCN:
Other
Taxonomic status: Domestic hybridization
Distribution: Crete, Theodoru Island
Wild Population: < 600 - slowly increasing
Field Studies: None
Threats: Hybridization, Poaching, Human interference or disturbance
Comments:
Recommendations:
Research management: Monitoring, Taxonomic, morphological and genetic studies
PHVA: No
Other:
Captive Population: 150
Captive Program Recommendation: Not currently recommended but may reconsider pending taxonomic clarification.

SPECIES: *Capra ibex ibex* (Alpine)
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other
Taxonomic status: OK
Distribution: European Alps
Wild Population: > 30,000
Field Studies: Various studies on-going
Threats: None
Comments: Present wild-population came from an estimate of 12 animals.
Recommendations:
Research management: None
PHVA: No
Other: No
Captive Population: over 300
Captive Program Recommendation: Not currently recommended

SPECIES: *Capra (ibex) sibirica*
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other
Taxonomic status: Number of subspecifics unclear
Distribution: Central Asian mountains
Wild Population: over 200,000
Field Studies: Perhaps 1 in India only.
Threats: Poaching, Loss of habitat because of exotic/domestic animals
Comments: There may be two subspecies in China (Hagenbeckii & Dementieve) which appear to be threatened.
Recommendations:
Research management: Limiting factors management and taxonomy
PHVA: No
Other:
Captive Population: more than 200
Captive Program Recommendation: Not currently recommended

SPECIES: *Ovis gmelini gmelini*
STATUS:
Mace-Lande: Safe/Vulnerable
CITES:
IUCN:
Other
Taxonomic status:
Distribution: Turkey, Western Iran and Southern Armenia
Wild Population: > 6,000 - more than two sub-populations
Field Studies:
Threats: Poaching, Interspecific competition from exotics
Comments: Central Turkish population is treated by Turkish officials as O.g. konya
Recommendations:
Research management: Survey, Limiting factors management
PHVA: No
Other:
Captive Population: 100 of known origin
Captive Program Recommendation: Not currently recommended

SPECIES: *Ovis gmelini musimon*
STATUS:
Mace-Lande: Safe/Vulnerable
CITES:
IUCN:
Other:
Taxonomic status:
Distribution: Corsica and Sardinia
Wild Population: < 3,000 two subpopulations
Field Studies: Ongoing
Threats: Poaching
Comments: Questionable origin
for captive colonies - many introductions throughout Europe
Recommendations:
Research management: Monitoring
PHVA: No
Other:
Captive Population: over 500
Captive Program Recommendation: Not currently recommended

SPECIES: *Ovis canadensis canadensis*
STATUS:
Mace-Lande: Safe
CITES: II
IUCN:
Other
Taxonomic status: ok
Distribution: western mountains of North America
Wild Population: <15,000
Field Studies: many
Threats: Disease
Comments:
Recommendations:
Research management: Monitoring
PHVA: no
Other:
Captive Population: approx. 120
Captive Program Recommendation: Not currently recommended; existing populations used for translocations

SPECIES: *Ovis canadensis californiana*
STATUS:
Mace-Lande: Safe
CITES: II
IUCN:
Other: CA F&G
Taxonomic status: ok
Distribution: British Columbia, Washington, Oregon, California: dry mountains west of Rockies.
Wild Population: >4000
(five + subpopulations)
Field Studies: ongoing - numerous
Threats: disease from domestic sheep
Comments:
Recommendations:
Research management: Monitoring
PHVA: No
Other:
Captive Population: 20
Captive Program Recommendation: Not currently recommended

SPECIES: *Ovis canadensis nelsoni*
STATUS:
Mace-Lande: Safe/Vunerable
CITES: II
IUCN:
Other
Taxonomic status: ok
Distribution: western arid mountains of US
Wild Population: > 15,000
Field Studies: ongoing
Threats: Disease, Interspecific competition from exotics
Comments:
Recommendations:
Research management: Monitoring
PHVA: No
Other: No
Captive Population: 12
Captive Program Recommendation: Increase captive program

SPECIES: *Ovis dalli dalli*
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other
Taxonomic status: ok
Distribution: Aslaka, NWT, BC, Yukon
Wild Population: >15000
Field Studies: ongoing
Threats: none
Comments: none
Recommendations:
Research management: Monitoring
PHVA: no
Other: no
Captive Population: 120
Captive Program Recommendation: Increase captive program

SPECIES: *Ovis dalli stonei*
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other
Taxonomic status: ok
Distribution: northern BC and Yukon
Wild Population: >10000
Field Studies: ongoing
Threats: none
Comments: none
Recommendations:
Research management: Monitoring
PHVA: no
Other: no
Captive Population: 10 +
Captive Program Recommendation: Increase captive program

SPECIES: *Ovis nivicola nivicola*
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other
Taxonomic status: review warranted
Distribution: Kamchatka Peninsula, West Siberia
Wild Population: 5000 - 12000
Field Studies: recent yes ?
Threats: Poaching, Interspecific competition from exotics, Hunting
Comments:
Recommendations:
Research management: Survey, Limiting factors management
PHVA: no
Other:
Captive Population: 15 - 20
Captive Program Recommendation: Increase ongoing captive program

SPECIES: *Ovis nivicola lydekkeri*
STATUS:
Mace-Lande: Safe
CITES:
IUCN:
Other
Taxonomic status: sometimes split into lydekkeri and alleni
Distribution: East and Northeast Siberia
Wild Population: 4000 - 8000
Field Studies: ?
Threats: Poaching, Interspecific competition from exotics
Comments:
Recommendations:
Research management: Survey, Limiting factors management
PHVA: no
Other: no
Captive Population: None.
Captive Program Recommendation: Pending

SPECIES: *Hemitragus jemlahicus*
STATUS:
Mace-Lande: Safe?
CITES:
IUCN:
Other:
Taxonomic status:
Distribution: Kashmir to Sikkim, India. Introduced in New Zealand, South Africa
Wild Population: < 30,000
Field Studies: One in progress.
Threats: Loss and fragmentation of habitat because of deforestation
Comments:
Recommendations:
Research management:
PHVA: No
Other:
Captive Population: 250+ worldwide. During the last two decades, the number of captive specimens has declined. This species should be closely monitored so it does not disappear in captivity.
Captive Program Recommendation: Not currently recommended but may be reconsidered pending further data

SPECIES: *Capra aegagrus blythi*
STATUS:
Mace-Lande: Safe?
CITES:
IUCN:
Other
Taxonomic status:
Distribution: Pakistan, Afghanistan Eastern Iran
Wild Population: < 5,000 - Stable?
Field Studies: ?
Threats: Interspecific competition from exotics, poaching
Comments:
Recommendations:
Research management: Taxonomic, morphological and genetic studies, Survey, Limiting factors management
PHVA: No
Other:
Captive Population: None
Captive Program Recommendation:

SPECIES: *Capra pyrenaica hispanica*
STATUS:
Mace-Lande: Safe?
CITES:
IUCN:
Other
Taxonomic status:
Distribution: Southeast Spain
Wild Population: 8,000
Field Studies: Yes
Threats: none?
Comments:
Recommendations:
Research management: Monitoring
PHVA: No
Other:
Captive Population: None
Captive Program Recommendation: Not recommended at this time.

SPECIES: *Capra pyrenaica victoriae*
STATUS:
Mace-Lande: Safe?
CITES:
IUCN:
Other
Taxonomic status:
Distribution: Central Spain
Wild Population: 3,300
Field Studies: No?
Threats: ?
Comments:
Recommendations:
Research management: Monitoring
PHVA: No
Other:
Captive Population: None
Captive Program Recommendation: Not recommended at this time.

SPECIES: *Ovis ammon collium*
STATUS:

Mace-Lande: Safe ?
CITES: II
IUCN: No
Other Category III (USSR), Endangered (USFW)

Taxonomic status: Sometimes considered synonymous with karelini
Distribution: Kasachstan (Mongolia ?)
Wild Population: 8000 - 10000
Field Studies:
Threats: Poaching, competition with livestock, habitat loss
Comments:
Recommendations:

Research management: Taxonomy, Survey, Limiting factors management
PHVA: Yes (combined with other ammon subspecies)
Other:

Captive Population: None
Captive Program Recommendation: pending

SPECIES: *Ammotragus lervia ornatus*
STATUS:
Mace-Lande: Extinct
CITES:
IUCN:
Other:
Taxonomic status:
Distribution: Upper and lower Egypt between the Nile and the Red Sea. In lower Egypt, extinct since 1920, and upper since approx. 1950.
Wild Population:
Field Studies:
Threats:
Comments:
Recommendations:
Research management: Survey
PHVA:
Other:
Captive Population: Extinct
Captive Program Recommendation:

SPECIES: *Capra pyrenaica lusitanica*
STATUS:
Mace-Lande: Extinct
CITES:
IUCN:
Other:
Taxonomic status:
Distribution:
Wild Population:
Field Studies:
Threats:
Comments:
Recommendations:
Research management: None
PHVA: No
Other:
Captive Population: Extinct
Captive Program Recommendation: None

Table 10. Categorization according to Mace-Lande criteria and recommendations for all Caprine taxa.

	TAXON		WILD POPULATION										CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	REC	ISIS	NUM
	BOVIDAE														
	Caprinae														
1	*Capricornis*	*sumatraensis*													
2	*Capricornis*	*sumatraensis sumatraensis*	Malaya & Sumatra	<1,500?	2-3	10+?	D	F?	E	Hp,Lf	Y	T,S,Hm	N-1		12-15
3	*Capricornis*	*sumatraensis maritimus*	Laos, Vietnam, Thailand & Burma	2,000?	3	20+?	D	G?	E	Hp,Lf	Y	T,S,Hm	I-1		8-10
4	*Capricornis*	*sumatraensis milneedwardsii*	S.Eastern China	<4,000?	2-3	20+?	D	F?	V	Hp,Lf	Y	T,S,Hm	N-2		0
5	*Capricornis*	*sumatraensis rubidus*	Burma, India	<2,500?	2-3	20+?	D	F?	E	Hp,Lf	Y	T,S,Hm	I-1		4-5?
6	*Capricornis*	*sumatraensis thar*	Himalayas	<5,000?	2-3	20+?	D	E?	V	Hp,Lf	Y	T,S,Hm	N-2		0
7	*Capricornis*	*crispus*												2	
8	*Capricornis*	*crispus crispus*	Kyushu, Honshu Shikoku Isl	100,000	1-2	30+	S	E	S		N	NONE	N	6	65+
9	*Capricornis*	*crispus swinhoei*	Central Taiwan	<5,000?	2-3	2+	D	C?	V	Hp,Lf	Y	T,S,Hm	N-2	8	15-20
10	*Nemorhaedus*	*baileyi*													
11	*Nemorhaedus*	*baileyi baileyi*	S.E. Tibet	<2,000?	2	2+?	D	B?	E	Hp,Lf	Y	T,S,Hm	I-1		15-20
12	*Nemorhaedus*	*baileyi cranbrooki*	Assam & upper Burma	<2,000?	3-4	2+?	D	C?	E	Hp,Lf	Y	T,S,Hm	I-1	2	0
13	*Nemorhaedus*	*caudatus*													
14	*Nemorhaedus*	*caudatus caudatus*	N Eastern China, E Russia, Korea	<2,000?	2-3	10+?	D	G?	E	Hp,Lf	Y	T,S,Hm	I-1	2	10+

	TAXON		WILD POPULATION										CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	REC	ISIS	NUM
15	*Nemorhaedus*	*caudatus evansi*	Burma & Thailand	<2,000?	3	3+?	D	E?	E	Hp,Lf	Y	T,S,Hm	I-1		0
16	*Nemorhaedus*	*caudatus griseus*	Sichuan, N.Yunan	<10,000?	2-3	10+?	D	E?	V	Hp,Lf	Y	T,S,Hm	I-2	1	1
17	*Nemorhaedus*	*caudatus arnouxianus*	Central China	<10,000?	2-3	10+?	D	D?	V	Hp,Lf	Y	T,S,Hm	N-2	19	40-50
18	*Nemorhaedus*	*goral*												4	
19	*Nemorhaedus*	*goral goral*	Eastern Himalaya	<5,000?	2-3	10+?	D	D?	V	Hp,Lf	Y	T,S,Hm	N-1		5-6
20	*Nemorhaedus*	*goral bedfordi*	Western Himalaya	<5,000?	2-3	10+?	D	D?	V	Hp,Lf	Y	T,S,Hm	I-1		5
21	*Oreamnos*	*americanus*	Alaska to Washington E to Yukon	>10,000	1-2	50+	I	G	S	NONE	N	NONE	N	116	100+
22	*Rupicapra*	*rupicapra*	Northeastern chamois											33	
23	*Rupicapra*	*rupicapra rupicapra*	Alpine Arch	>200,000	1-2	12+	I	G	S	NONE	N	NONE	N	35	200-300
24	*Rupicapra*	*rupicapra asiatica*	Pontus chain, & Central, East Turkey	<10,000?	2-3	10+?	S?	E?	V	Hp,La	Y	T,S,Hm	N-Pend		0
25	*Rupicapra*	*rupicapra balcanica*	Balkans	>20,000	1-2	20+	I	E	S	Hyb	Y	T*	N-Pend		0
26	*Rupicapra*	*rupicapra cartusiana*	N of Grenoble	<150	1	1	D	C	C	Hp,Hyb, La,Ic	Y	Hm	I-1		0
27	*Rupicapra*	*rupicapra caucasica*	Caucasus & Anti Caucasus	<10,000?	3	3+	D	C?	V	Hp,Ic	Y	Hm	N-Pend		0
28	*Rupicapra*	*rupicapra tatrica*	Tatras	<1,000	2,3	2	D	C	E	Hp,Hyb, I	Y	Hm,T	I-1		0
29	*Rupicapra*	*rupicapra carpatica*	Carpathian Mts	<10,000	2	1	D	C	V	Hp	Y	Hm	N-Pend		0

	TAXON		WILD POPULATION										CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	REC	ISIS	NUM
30	*Rupicapra*	*pyrenaica*	Southwestern chamois												
31	*Rupicapra*	*pyrenaica pyrenaica*	Pyrenees	>20,000	1	1	S	C	V	Hp,La	Y	Lm	N-Pend		0
32	*Rupicapra*	*pyrenaica ornata*	Apennines	<500	1	2	I	C	E	La	Y	T	N-1		20
33	*Rupicapra*	*pyrenaica parva*	Cantabrian Mts	<10,000	1	3	I	C	V	Hp,La	Y	Lm	N-Pend		0
34	*Ovibos*	*moschatus*													
35	*Ovibos*	*moschatus moschatus*	Alaska, Canada	>10,000	1	100+	I	G?	S	NONE	N	NONE	N-Pend	12	50+
36	*Ovibos*	*moschatus wardi*	Greenland	>10,000	1	100+	I	G?	S	NONE	N	NONE	N-Pend	35	+above
37	*Budorcas*	*taxicolor*													
38	*Budorcas*	*taxicolor taxicolor, & whitei*	Assam, Bhutan	<10,000?	2,3	10+?	D	D?	V	Hp,L	Y	Hm,T	N-1	5	19
39	*Budorcas*	*taxicolor tibetanus*	Sichuan & Gansu	<5,000?	2,3	5+?	D	E?	V	Hp,L	Y	Hm	N-1	9	30
40	*Budorcas*	*taxicolor bedfordi*	Qinling Mountains	1,200	2,3	0	D	B	E	H,L	Y	Hm	I-1	0	20
41	*Ammotragus*	*lervia*													
42	*Ammotragus*	*lervia lervia*	Tunisia to Mauritania	>3,000	2-4	20+	S	E	V	H,La	Y	T,S	N-Pend	2	0
43	*Ammotragus*	*lervia fassini*	Bou Hedma Reserve, SE Tunisia	<200?	3-4	10+?	D	D?	C	H,La	Y	T,S	I-1	0	15
44	*Ammotragus*	*lervia ornatus*	Egypt	EXTC?	3-4				Ext		N	S	N	0	0
45	*Ammotragus*	*lervia blainei*	border of Egypt, Sudan & Libya	<200?	3-4	10?	D	D?	C	H,La	Y	T,S	I-1	0	4+
46	*Ammotragus*	*lervia angusi*	Air region & Ifoghas, Niger	<5,000?	3-4	2	D	D?	V	H,La	Y	T,S	I-1	0	0

	TAXON		WILD POPULATION										CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	REC	ISIS	NUM
47	*Ammotragus*	*lervia sahariensis*	Chad, Ahaggar, Tibesti, Tassili n'Azdjer	<2,500?	3-4	?	D	D?	E	H,La	Y	T,S	I-1	0	160
48	*Pseudois*	*nayaur*												15	
49	*Pseudois*	*nayaur nayaur*	Himalayas & Tibet	>20,000?	2-4	20+?	S	G?	S	N	N	NONE	N-Pend		?
50	*Pseudois*	*nayaur szechuanensis*	Sheensi, China	>20,000?	2-4	20+?	D	G?	V	H,L	N	NONE	I-1	10	50+
51	*Pseudois*	*[nayaur] nayaur schaeferi*	Yangtze river valley near Bantang	<2,500?	3	1	D	AA-2	E	H	Y	T	I-1		0
52	*Hemitragus*	*jemlahicus*	(includes New Zealand), Kashmir to Sikkim	<30,000	2-4	10+	S	E	S?	Lf	N	T	N-Pend	217	250+
53	*Hemitragus*	*hylocrius*	Nilgiri Hills to W. Ghats	<2,500	2	10+	D	B	E	Hp,L,I	Y	Hm	I-1	20	30+
54	*Hemitragus*	*jayakari*	Northern Oman	1,000?	3-4	?	D	C	E	La,Ice	Y	S	I-1		10+
55	*Capra*	*aegagrus*	Turkey, W.Iran, Caucasus											17	
56	*Capra*	*aegagrus aegagrus*		1,000+	2-4	>5	D	?	S	Hp,Ice,L	N	M	N	4	?
57	*Capra*	*aegagrus cretica*		<600	1-2	2	I-	?	S/V	Hyb,Hp, I	N	T,M	N-Pend	6	150
58	*Capra*	*aegagrus blythi*	Pakistan, Iran,	<5,000?	3-4	>10?	S/D	E?	S?	Ice,Hp	N	S,Lm,T	N	50?	0
59	*Capra*	*aegagrus chialtanensis*	Pakistan	<500	3	1	D?	AA-2?	C/E	Hp,Ice	Y	Lm,T,S	N-Pend		0
60	*Capra*	*aegagrus turcmenica*	South Turkmenia, N.Iran	<2,500	3-4	3?	D	?	V	Hp,Ice,L	N	S,M	I-1		1
61	*Capra*	*falconeri*												30	

	TAXON		WILD POPULATION										CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	REC	ISIS	NUM
62	*Capra*	*falconeri falconeri*	Afganistan, Pakistan, Kashmir	<3,500	2-4	>5	D	C?	V/E	H,Hp,Ice	Y	Lm,S,Hm	N-Pend	0	0
63	*Capra*	*falconeri megaceros*	Pakistan, Afghanistan	<1,000	2-4	>5	D	C?	E/C	H,Hp,Ice	Y	Lm,S,Hm	I-1	0	0
64	*Capra*	*falconeri heptneri*	Dashtidjum district, Tadjikistan	<700	3	1?	D	B?	E/C	Hp,War	Y	Lm,S	I-1	62	<200
65	*Capra*	*ibex*	Alpine ibex	>30,000	1-2	>10	I	D?	S	NONE	N	NONE	N	77	>300
66	*Capra*	*nubiana*													
67	*Capra*	*nubiana sinaitica*	Egypt (Sinai), Arabia, Israel, Jordan, Oman	2,000-5,000?	1-4	>10?	S?	C?	V	La,I,Hp,Ice	Pend	T, S,Lm	N	155?	>100
68	*Capra*	*nubiana nubiana*	Egypt, Sudan, Ethiopia	200-1,000?	4	>10?	D	AA/B?	C/E	L,Hp,La, Dr	Y	S,T,Lm, Lh	N-Pend		<50
69	*Capra*	*walia*	Ethiopia, (Simen Mts)	<400?	3	1	S/D	AA-2?	C/E	L,Hp,I,Ice	Y	S,Hm	N-Pend	0	0
70	*Capra*	*sibirica*	Russia, Mongolia, Tadjikistan, Tadjik, Kasmir	>200,000	2-4	>10	S?	E?	S	Hp,La	N	Lm,T	N	73	>200
71	*Capra*	*pyrenaica*													
72	*Capra*	*pyrenaica pyrenaica*	N Spain	10	1	1	D?	AA-3?	C	Hp,Ice,G?	Y	Lr	N-Pend		0
73	*Capra*	*pyrenaica hispanica*	SE Spain	8,000	1	6	S	C?	S?	None?	N	M	N	4	5
74	*Capra*	*pyrenaica victoriae*	C. Spain	3,300	1	1	S	B?	S?	?	N	M	N		0
75	*Capra*	*pyrenaica lusitanica*	extinct						Ext		N		N		
76	*Capra*	*caucasica*	western 1/3 of Caucasus	<10,000	3	1?	D?	C?	V/E	Hp,Ice?, War	N	S,M,Lm	I-1	74	100±

	TAXON		WILD POPULATION										CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	REC	ISIS	NUM
77	*Capra*	*cylindricornis*	eastern 2/3 of Caucasus	<15,000	3	1?	D+?	B?	E	Hp,Ice, War	N	S,M,Lm	I-1	9	<10
78	*Ovis*	*gmelini*													
79	*Ovis*	*gmelini gmelini*	Turkey, W.Iran, & S. Armenia	>6,000?	3-4	>24	D+?	E?	S/V	Hp,Ice	N	S,Lm	N-Pend	40	100
80	*Ovis*	*gmelini isphahanica*	Esfahan mouflon												
81	*Ovis*	*gmelini laristanica*	Laristan mouflon												
82	*Ovis*	*gmelini musimon*	Sardinia & Corsica	<3,000	1-2	2	S	AA?	S/V	Hp	N	M	N-Pend		>500
83	*Ovis*	*gmelini ophion*	Cyprus	1,200	1-2	1	S	AA-2?	V	D	N	M	N-1		<100
84	*Ovis*	*vignei*													
85	*Ovis*	*vignei arkal*	E. Iran, Transcaspasian	>5,000?	4	>2?	S/D?	E?	V	Hp,Ice?	N	S,Lm	N-Pend		0
86	*Ovis*	*vignei blanfordi*		See cyclo-ceros		?									
87	*Ovis*	*vignei cycloceros*	Afghanistan, Pakistan, Turkmenistan	<12,000?	3-4	>2?	D?	E?	V	Hp,Ice,L ,P?	N	S,Lm	N-Pend	7	50
88	*Ovis*	*vignei punjabiensis*	N. Pakistan	<1,500	3	>5	D	B?	E	Hp,Ice,D	N	S,Lm	I-1		0
89	*Ovis*	*vignei severtzovi*	Uzbekistan	1,500?	3-4	?	S?	B?	E/V	Hp,Ice	N	S,Lm	N-Pend		?
90	*Ovis*	*vignei vignei*	NE Pakistan, NW India to Indus River	<2,000	2-3	>2	D+?	C?	C/E	Hp,Ice	Y(w. markh or)	S,Lm	I-1	0	0
91	*Ovis*	*vignei bochariensis*	Tadjikhistan	1,000	3	?	D		C/E	Hp,Ice, Dr	N	S,Lm	I-1		0?
92	*Ovis*	*ammon*													

	TAXON		WILD POPULATION										CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	REC	ISIS	NUM
93	*Ovis*	*ammon ammon*	Mongolia, Kazakhstan, China	<12,000?	2-4	>5?	D	?	V	Ice,H	Y	S,M,Lm	N-Pend	1	<10
94	*Ovis*	*ammon darwini*	Mongolia & China	<3,000?	3-4	>5?	D	?	V/E	Hp,Ice	Y	T,Lm,S	N-Pend		0
95	*Ovis*	*ammon jubata*	Northern + NW China	<700?	3-4	>2?	D	?	E	Hp	Y	T,S,Lm	N-Pend		0
96	*Ovis*	*ammon hodgsoni*	Himalayas, Tibetan argali	5,000-20,000?	2-4	>10?	D?	?	V/E	Hp,L, Ice	Y	S,T,Lm	N-Pend		0?
97	*Ovis*	*ammon karelini*	Tien Shan Mts China	<10,000?	3-4	>5?	D	?	V/E	Hp,Ice,La	Y	T,S,Lm	N-Pend		0?
98	*Ovis*	*ammon nigrimontana*	Kazakhstan, Kara Tau Mts	250?	3-4	?	D+	?	C	Hp, Ice	N	S,Lm	I-1	1	0?
99	*Ovis*	*ammon polii*	Afganistan, Pakistan, Pamir China	<18,000?	2-4	>5?	D	?	V/E	Hp,La, Ice	Y	S,Lm	N-Pend	0	0?
100	*Ovis*	*ammon collium*	NE Kazakhstan	8,000-10,000?	3-4	?	I?	?	S?	Hp,La, Ice	Y	S,Lm	N-Pend		0?
101	*Ovis*	*canadensis*													
102	*Ovis*	*canadensis canadensis*	West Mts N America	15,000+	1-2	20+	S	?	S	D	N	M	N	97	120
103	*Ovis*	*canadensis californiana*	Dry mts W of Rockies	4,000+	1-2	5	S/I	?	S	D	N	M	N	13	20
104	*Ovis*	*canadensis cremnobates + weemsi*	SW Calif & Baja Calif	<3,000?	3-4	>2?	C/E	?	E	Hp,D,Ice,L	Y	T?,S,Lm	I-1	9	10
105	*Ovis*	*canadensis mexicana*	N. Mexico, Sonoran Desert	<500	3-4	>2?	D	?	E/C	D,Hp,Ice,L	Y	S,Lm,T?	I-1	12	12
106	*Ovis*	*canadensis nelsoni*	Western arid Mts of USA	>15,000	1-2	>10	S	?	S/V	D,Ice	N	M	I-1	10	12
107	*Ovis*	*dalli*												3	

	TAXON		WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L STS	THRTS	PVA/ WKSP	RSCH MGMT	REC	ISIS	NUM
108	*Ovis*	*dalli dalli*	Alaska, NWT Brit Columbia, Yukon	>15,000	1-2	5+	S	?	S	NONE	N	M	N-1	121	120
109	*Ovis*	*dalli stonei*	N Brit. Colum., Yukon	>10,000	1-2	5+	S	?	S	NONE	N	M	N-1	2	10+
110	*Ovis*	*nivicola*												3	
111	*Ovis*	*nivicola nivicola*	Kamchatka Peninsula	5,000-12,000	2	2+	S	?	S	Hp,Ice,H	N	S,Lm	N-1	2	15+
112	*Ovis*	*nivicola borealis*	Putoran Mts N Central Siberia	<3,000	2-3	1?	S	?	V	Hp,Ice	N	S,Lm	N-1		10
113	*Ovis*	*nivicola lydekkeri*	Yakut sheep E. & NE Siberia	4,000-8,000?	2-3	>5?	S	?	S	Hp,Ice	N	S,Lm	N-Pend		0

Table 11. Caprine taxa recommended for intensively-managed captive populations.

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
104	*Ovis*	*canadensis cremnobates + weemsi*	SW Calif & Baja Calif	<3,000?	3-4	>2?	C/E	?	E	Hp,D,Ice,L	Y	T?,S,Lm	I-1	9	10
105	*Ovis*	*canadensis mexicana*	N. Mexico, Sonoran Desert	<500	3-4	>2?	D	?	E/C	D,Hp,Ice,L	Y	S,Lm,T?	I-1	12	12
106	*Ovis*	*canadensis nelsoni*	Western arid Mts of USA	>15,000	1-2	>10	S	?	S/V	D,Ice	N	M	I-1	10	12
11	*Nemorhaedus*	*baileyi baileyi*	S.E. Tibet	<2,000?	2	2+?	D	B?	E	Hp,Lf	Y	T,S,Hm	I-1		15-20
12	*Nemorhaedus*	*baileyi cranbrooki*	Assam & upper Burma	<2,000?	3-4	2+?	D	C?	E	Hp,Lf	Y	T,S,Hm	I-1	2	0
14	*Nemorhaedus*	*caudatus caudatus*	N Eastern China, E Russia, Korea	<2,000?	2-3	10+?	D	G?	E	Hp,Lf	Y	T,S,Hm	I-1	2	10+
15	*Nemorhaedus*	*caudatus evansi*	Burma & Thailand	<2,000?	3	3+?	D	E?	E	Hp,Lf	Y	T,S,Hm	I-1		0
20	*Nemorhaedus*	*goral bedfordi*	Western Himalaya	<5,000?	2-3	10+?	D	D?	V	Hp,Lf	Y	T,S,Hm	I-1		5
26	*Rupicapra*	*rupicapra cartusiana*	N of Grenoble	<150	1	1	D	C	C	Hp,Hyb,La,Ic	Y	Hm	I-1		0
28	*Rupicapra*	*rupicapra tatrica*	Tatras	<1,000	2,3	2	D	C	E	Hp,Hyb,I	Y	Hm,T	I-1		0
3	*Capricornis*	*sumatraensis maritimus*	Laos, Vietnam, Thailand & Burma	2,000?	3	20+?	D	G?	E	Hp,Lf	Y	T,S,Hm	I-1		8-10
40	*Budorcas*	*taxicolor bedfordi*	Qinling Mountains	1,200	2,3	0	D	B	E	H,L	Y	Hm	I-1	0	20

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
43	*Ammotragus*	*lervia fassini*	Bou Hedma Reserve, SE Tunisia	<200?	3-4	10+ ?	D	D?	C	H,La	Y	T,S	I-1	0	15
45	*Ammotragus*	*lervia blainei*	border of Egypt, Sudan & Libya	<200?	3-4	10?	D	D?	C	H,La	Y	T,S	I-1	0	4+
46	*Ammotragus*	*lervia angusi*	Air region & Ifoghas, Niger	<5,000?	3-4	2	D	D?	V	H,La	Y	T,S	I-1	0	0
47	*Ammotragus*	*lervia sahariensis*	Chad, Ahaggar, Tibesti, Tassili n'Azdjer	<2,500?	3-4	?	D	D?	E	H,La	Y	T,S	I-1	0	160
5	*Capricornis*	*ssumatraensis rubidus*	Burma, India	<2,500?	2-3	20+ ?	D	F?	E	Hp,Lf	Y	T,S,Hm	I-1		4-5?
50	*Pseudois*	*nayaur szechuanensis*	Sheensi, China	>20,000?	2-4	20+ ?	D	G?	V	H,L	N	N	I-1	10	50+
51	*Pseudois*	*[nayaur] nayaur schaeferi*	Yangtze river valley near Bantang	<2,500?	3	1	D	AA-2	E	H	Y	T	I-1		0
53	*Hemitragus*	*hylocrius*	Nilgiri Hills to W. Ghats	<2,500	2	10+	D	B	E	Hp,L,I	Y	Hm	I-1	20	30+
54	*Hemitragus*	*jayakari*	Northern Oman	1,000?	3-4	?	D	C	E	La,Ice	Y	S	I-1		10+
60	*Capra*	*aegagrus turcmenica*	South Turkmenia, N.Iran	<2,500	3-4	3?	D	?	V	Hp,Ice,L	N	S,M	I-1		1
63	*Capra*	*falconeri megaceros*	Pakistan, Afghanistan	<1,000	2-4	>5	D	C?	E/C	H,Hp,Ice	Y	Lm,S,H	I-1	0	0
64	*Capra*	*falconeri heptneri*	Dashtidjum district, Tadjikistan	<700	3	1?	D	B?	E/C	Hp,War	Y	Lm,S	I-1	62	<200
76	*Capra*	*caucasica*	western 1/3 of Caucasus	<10,000	3	1?	D?	C?	V/E	Hp,Ice?, War	N	S,M,Lm	I-1	74	100±
77	*Capra*	*cylindricornis*	eastern 2/3 of Caucasus	<15,000	3	1?	D+?	B?	E	Hp,Ice, War	N	S,M,Lm	I-1	9	<10

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
88	*Ovis*	*vignei punjabiensis*	N. Pakistan	<1,500	3	>5	D	B?	E	Hp,Ice, D	N	S,Lm	I-1		0
90	*Ovis*	*vignei vignei*	NE Pakistan, NW India to Indus River	<2,000	2-3	>2	D+?	C?	C/E	Hp,Ice	Y(w. mark hor)	S,Lm	I-1	0	0
91	*Ovis*	*vignei bochariensis*	Tadjikistan	1,000	3	?	D		C/E	Hp,Ice, Dr	N	S,Lm	I-1		0?
98	*Ovis*	*aammon nigrimontana*	Kazakhstan, Kara Tau Mts	250?	3-4	?	D+	?	C	Hp, Ice	N	S,Lm	I-1	1	0?
16	*Nemorhaedus*	*caudatus griseus*	Sichuan, N.Yunan	<10,000?	2-3	10+?	D	E?	V	Hp,Lf	Y	T,S,Hm	I-2	1	1

Table 12. Caprine taxa recommended for Nucleus populations.

CODE	TAXON		RANGE	WILD POPULATION									CAPTIVE PROGRAM		
	SCIENTIFIC NAME			EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
2	*Capricornis*	*sumatraensis sumatraensis*	Malaya & Sumatra	<1,500?	2-3	10+?	D	F?	E	Hp,Lf	Y	T,S,Hm	N-1		12-15
4	*Capricornis*	*sumatraensis milneedwardsii*	S.Eastern China	<4,000?	2-3	20+?	D	F?	V	Hp,Lf	Y	T,S,Hm	N-2		0
6	*Capricornis*	*sumatraensis thar*	Himalayas	<5,000?	2-3	20+?	D	E?	V	Hp,Lf	Y	T,S,Hm	N-2		0
9	*Capricornis*	*crispus swinhoei*	Central Taiwan	<5,000?	2-3	2+	D	C?	V	Hp,Lf	Y	T,S,Hm	N-2	8	15-20
17	*Nemorhaedus*	*caudatus arnouxianus*	Central China	<10,000?	2-3	10+?	D	D?	V	Hp,Lf	Y	T,S,Hm	N-2	19	40-50
19	*Nemorhaedus*	*goral goral*	Eastern Himalaya	<5,000?	2-3	10+?	D	D?	V	Hp,Lf	Y	T,S,Hm	N-1		5-6
32	*Rupicapra*	*pyrenaica ornata*	Apennines	<500	1	2	I	C	E	La	Y	T	N-1		20
38	*Budorcas*	*taxicolor taxicolor, & whitei*	Assam, Bhutan	<10,000?	2,3	10+?	D	D?	V	Hp,L	Y	Hm,T	N-1	5	19
39	*Budorcas*	*taxicolor tibetanus*	Sichuan & Gansu	<5,000?	2,3	5+?	D	E?	V	Hp,L	Y	Hm	N-1	9	30
83	*Ovis*	*gmelini ophion*	Cyprus	1,200	1-2	1	S	AA-2?	V	D	N	M	N-1		<100
108	*Ovis*	*dalli dalli*	Alaska, NWT Brit Columbia, Yukon	>15,000	1-2	5+	S	?	S	NONE	N	M	N-1	121	120
109	*Ovis*	*dalli stonei*	N Brit. Colum., Yukon	>10,000	1-2	5+	S	?	S	NONE	N	M	N-1	2	10+
111	*Ovis*	*nivicola nivicola*	Kamchatka Peninsula	5,000-12,000	2	2+	S	?	S	Hp,Ice, H	N	S,Lm	N-1	2	15+

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
112	*Ovis*	*nivicola borealis*	Putoran Mts N Central Siberia	<3,000	2-3	1?	S	?	V	Hp,Ice	N	S,Lm	N-1		10

Taxa recommended for nucleus population

Table 13. Caprine taxa not currently recommended for captive programs pending PHVA or survey data.

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
24	*Rupicapra*	*rupicapra asiatica*	Pontus chain, & Central, East Turkey	<10,000?	2-3	10+?	S?	E?	V	Hp,La	Y	T,S,Hm	N-Pend		0
25	*Rupicapra*	*rupricapra balcanica*	Balkans	>20,000	1-2	20+	I	E	S	Hyb	Y	T*	N-Pend		0
27	*Rupicapra*	*rupicapra caucasica*	Caucasus & Anti Caucasus	<10,000?	3	3+	D	C?	V	Hp,Ic	Y	Hm	N-Pend		0
29	*Rupicapra*	*rupicapra carpatica*	Carpathian Mts	<10,000	2	1	D	C	V	Hp	Y	Hm	N-Pend		0
31	*Rupicapra*	*pyrenaica pyrenaica*	Pyrenees	>20,000	1	1	S	C	V	Hp,La	Y	Lm	N-Pend		0
33	*Rupicapra*	*pyrenaica parva*	Cantabrian Mts	<10,000	1	3	I	C	V	Hp,La	Y	Lm	N-Pend		0
35	*Ovibos*	*moschatus moschatus*	Alaska, Canada	>10,000	1	100+	I	G?	S	NONE	N	NONE	N-Pend	12	50+
36	*Ovibos*	*moschatus wardi*	Greenland	>10,000	1	100+	I	G?	S	NONE	N	NONE	N-Pend	35	+above
42	*Ammotragus*	*lervia lervia*	Tunisia to Mauritania	>3,000	2-4	20+	S	E	V	H,La	Y	T,S	N-Pend	2	0
49	*Pseudois*	*nayaur nayaur*	Himalayas & Tibet	>20,000?	2-4	20+?	S	G?	S	N	N	N	N-Pend		?
52	*Hemitragus*	*jemlahicus*	(includes New Zealand), Kashmir to Sikkim	<30,000	2-4	10+	S	E	S?	Lf	N	T	N-Pend	217	250+
57	*Capra*	*aegagrus cretica*		<600	1-2	2	I-	?	S/V	Hyb,Hp,I	N	T,M	N-Pend	6	150

Captive recommendation pending

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
59	*Capra*	*aegagrus chialtanensis*	Pakistan	<500	3	1	D?	AA-2?	C/E	Hp,Ice	Y	Lm,T, S	N-Pend		0
62	*Capra*	*falconeri falconeri*	Afganistan, Pakistan, Kashmir	<3,500	2-4	>5	D	C?	V/E	H,Hp,Ice	Y	Lm,S, H	N-Pend	0	0
68	*Capra*	*nubiana nubiana*	Egypt, Sudan, Ethiopia	200-1,000?	4	>10 ?	D	AA/B?	C/E	L,Hp,La ,Dr	Y	S,T,Lm,Ln	N-Pend		<50
69	*Capra*	*walia*	Ethiopia, (Simen Mts)	<400?	3	1	S/D	AA-2?	C/E	L,Hp,I,Ice	Y	S,Hm	N-Pend	0	0
72	*Capra*	*pyrenaica pyrenaica*	N Spain	10	1	1	D?	AA-3?	C	Hp,Ice, G?	Y	Lr	N-Pend		0
79	*Ovis*	*gmelini gmelini*	Turkey, W.Iran, & S. Armenia	>6,000?	3-4	>24	D+?	E?	S/V	Hp,Ice	N	S,Lm	N-Pend	40	100
82	*Ovis*	*gmelini musimon*	Sardinia & Corsica	<3,000	1-2	2	S	AA?	S/V	Hp	N	M	N-Pend		>500
85	*Ovis*	*vignei arkal*	E. Iran, Transcaspasian	>5,000?	4	>2?	S/D?	E?	V	Hp,Ice?	N	S,Lm	N-Pend		0
87	*Ovis*	*vignei cycloceros*	Afghanistan, Pakistan, Turkmenistan	<12,000?	3-4	>2?	D?	E?	V	Hp,Ice,L ,P?	N	S,Lm	N-Pend	7	50
89	*Ovis*	*vignei severtzovi*	Uzbekistan	1,500?	3-4	?	S?	B?	E/V	Hp,Ice	N	S,Lm	N-Pend		?
93	*Ovis*	*ammon ammon*	Mongolia, Kazakhstan, China	<12,000?	2-4	>5?	D	?	V	Ice,H	Y	S,M,Lm	N-Pend	1	<10
94	*Ovis*	*ammon darwini*	Mongolia & China	<3,000?	3-4	>5?	D	?	V/E	Hp,Ice	Y	T,Lm, Sm	N-Pend		0
95	*Ovis*	*ammon jubata*	Northern + NW China	<700?	3-4	>2?	D	?	E	Hp	Y	T,S,Lm	N-Pend		0
96	*Ovis*	*ammon hodgsoni*	Himalayas, Tibetan argali	5,000-20,000 ?	2-4	>10 ?	D?	?	V/E	Hp,L, Ice	Y	S,T,Lm	N-Pend		0?

Captive recommendation pending

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
97	*Ovis*	*ammon karelini*	Tien Shan Mts China	<10,000?	3-4	>5?	D	?	V/E	Hp,Ice,La	Y	T,S,Lm	N-Pend		0?
99	*Ovis*	*ammon polii*	Afganistan, Pakistan, Pamir China	<18,000?	2-4	>5?	D	?	V/E	Hp,La, Ice	Y	S,Lm	N-Pend	0	0?
100	*Ovis*	*ammon collium*	NE Kazakhstan	8,000-10,000 ?	3-4	?	I?	?	S?	Hp,La, Ice	Y	S,Lm	N-Pend		0?
113	*Ovis*	*nivicola lydekkeri*	Yakut sheep E. & NE Siberia	4,000-8,000?	2-3	>5?	S	?	S	Hp,Ice	N	S,Lm	N-Pend		0

Captive recommendation pending

Table 14. Caprine taxa not recommended for captive programs.

	TAXON			WILD POPULATION									CAPTIVE PROGRAM		
CODE	SCIENTIFIC NAME		RANGE	EST#	DQ	SUB POP	TRND	AREA	M/L	THRTS	PVA	RSCH	REC	ISIS	
8	*Capricornis*	*crispus crispus*	Kyushu, Honshu Shikoku Isl	100,000	1-2	30+	S	E	S				NO	6	65+
21	*Oreamnos*	*americanus*	Alaska to Washington E to Yukon	>10,000	1-2	50+	I	G	S	NONE	N	NONE	NO	116	100+
23	*Rupicapra*	*rupicapra rupicapra*	Alpine Arch	>200,000	1-2	12+	I	G	S	NONE	N	NONE	NO	35	200-300
56	*Capra*	*aegagrus aegagrus*		1,000+	2-4	>5	D	?	S	Hp,Ice,L	N	M	NO	4	?
58	*Capra*	*aegagrus blythi*	Pakistan, Iran,	<5,000?	3-4	>10?	S/D	E?	S?	Ice,Hp	N	S,Lm,T	NO	50?	0
65	*Capra*	*ibex*	Alpine ibex	>30,000	1-2	>10	I	D?	S	NONE	N	N	N0	77	>300
67	*Capra*	*nubiana sinaitica*	Egypt (Sinai), Arabia, Israel, Jordan, Oman	2,000-5,000?	1-4	>10?	S?	C?	V	La,I,Hp, Ice	P	T,S,Lm	N0	155?	>100
70	*Capra*	*sibirica*	Russia, Mongolia, Tadjikistan, Kasmir	>200,000	2-4	>10	S?	E?	S	Hp,La	N	Lm,T	NO	73	>200
73	*Capra*	*pyrenaica hispanica*	SE Spain	8,000	1	6	S	C?	S?	None?	N	M	NO	4	5
74	*Capra*	*pyrenaica victoriae*	C. Spain	3,300	1	1	S	B?	S?	?	N	M	NO		0
102	*Ovis*	*canadensis canadensis*	West Mts N America	15,000+	1-2	20+	S	?	S	D	N	M	NO	97	120
103	*Ovis*	*canadensis californiana*	Dry mts W of Rockies	4,000+	1-2	5	S/I	?	S	D	N	M	NO	13	20

No captive recommendation

CAPRINAE

CONSERVATION ASSESSMENT AND MANAGEMENT PLAN (CAMP)

SECTION 3

PARTICIPANTS AND INVITEES

APPENDIX I.

CAPRINAE CAMP WORKSHOP PARTICIPANTS
MARCH, 1993

Sharon Baker
Zool. Society of San Diego
PO Box 551
San Diego, CA 92112
Tel: 619-557-3909
Fax: 619-232-4117

Bob Barnes
Los Angeles Zoo
5333 Zoo Drive
Los Angeles, CA 90027
Tel: 213-666-4650, Ext. 248
Fax: 213-662-9786

Stephen Castillo
Zool. Society of San Diego
PO Box 551
San Diego, CA 92112
Tel: 619-231-1515, Ext. 4499
Fax: 619-232-4117

James M. Dolan, Jr., Ph.D.
Zool. Society of San Diego
PO Box 551
San Diego, CA 92112
Tel: 619-557-3981
Fax: 619-232-4117

Toni Giezendanner
Zool. Society of San Diego
PO Box 551
San Diego, CA 92112
Tel: 619-685-3250
Fax: 619-232-4117

Wolfgang Grummt
Tierpark Berlin
Am Tierpark 125
D-1136 Berlin
Germany
Tel: 030-51531103
Fax: 030-5124061

Reg Hoyt
The Phoenix Zoo
455 N. Galvin Pkwy
Phoenix, AZ 85008-3931
Tel: 602-273-1341
Fax: 602-273-7078

Larry Killmar
Zool. Society of San Diego
15500 San Pasqual Valley Road
Escondido, CA 92027
Tel: 619-738-5056
Fax: 619-480-9573

Cyndi Kuehler
Zool. Society of San Diego
PO Box 551
San Diego, CA 92112
Tel: 619-685-3211
Fax: 619-232-4117

Sandro Lovari
Dipartimento Di Biologia Evolutiva
Via P.A. Mattioli, 4-53100
Siena, Italy
Tel: 39-577-298901
Fax: 39-577-298898

Ann Petric
Chicago Zoological Park
3300 Golf Road
Brookfield, IL 60513
Tel: 708-485-0263
Fax: 708-485-3532

Randy Rieches
San Diego Wild Animal Park
15500 San Pasqual Valley Road
Escondido, Ca 92027
Tel: 619-738-5015
Fax: 619-480-9573

M. Seal
9801 Pillsbury Ave. So.
Bloomington, MN 55420
Tel: 612-888-7267
Fax: 612-888-5550

Ulysses S. Seal
C.B.S.G.
12101 Johnny Cake Ridge Road
Apple Valley, MN 55124
Tel: 612-431-9325
Fax: 612-432-2757

David Shackleton
Department of Animal Science
University of British Columbia
Vancouver, British Columbia
Canada V6T 1Z4
Tel: 604-822-6873
Fax: 604-822-4400

Gregg S. Thompson
Woodland Park Zoo
5500 Phinney Avenue N.
Seattle, WA 98103
Tel: 206-684-4880
Fax: 206-684-4854

Roland Wirth
ICBP
Franz-Senn-Str. 14
8000 Munchen 70
Germany
Tel: 49-89-7142997
Fax: 49-89-7193327

CAPRINAE CAMP WORKSHOP
LIST OF INVITEES

Gerald Aguilina
Buffalo Zoological Gardens
Delaware Park
Buffalo, NY 14214
Tel: 716-837-3900
Fax: 716-837-0738

Bob Barnes
Los Angeles Zoo
5333 Zoo Drive
Los Angeles, CA 90027
Tel: 213-666-4650, ext.248
Fax: 213-662-9786

James M. Dolan, Jr., Ph.D.
Zoological Society of San Diego
PO Box 551
San Diego, CA 92112
Tel: 619-557-3981
Fax: 619-232-4117

Dr. Don Farst, Director
Gladys Porter Zoo
500 Ringgold Street
Brownsville, TX 78520
Tel: 210-546-7187
Fax: 210-541-4940

Dr. Val Geist
Faculty of Environmental Design
University of Calgary
2500 University Dr. N.W.
T2N 1N4 Calgary
Alberta, Canada
Tel: 403-220-6601
Fax:

Jack Grisham
Oklahoma City Zoological Park
2101 NE 50th Street
Oklahoma City, OK 73111
Tel: 405-424-3344
Fax: 405-424-3349

Pegi Harvey, Education Director
Zoological Society of San Diego
PO Box 551
San Diego, CA 92112
Tel: 619-231-1515
Fax: 619-237-0249

Reg Hoyt
The Phoenix Zoo
455 North Galvan Parkway
Phoenix, AZ 85008-3431
Tel: 602-273-1341
Fax: 602-273-7078

Dr. Michael Hutchins
Director of Conservation/Science
AAZPA Conservation Center
7970 Old Georgetown Road
Bethesda, MD 20814
Tel: 301-907-7777
Fax: 301-907-2980

Cyndi Kuehler, Curator of Zoology
Zoological Society of San Diego
PO Box 551
San Diego, CA 92112
Tel: 619-685-3211
Fax: 619-232-4117

Dr. Paul R. Krausman
Wildlife & Fisheries Science
University of Arizona
325 Biological Sciences East
Tucson, AZ 85721
Tel: 602-621-3845
Fax:

Dr. Sandro Lovari
Dipartimento Di Biologia Evolutiva
Via P.A. Mattioli, 4-53100
Sienna, Italy
Tel: 39-577-298-901
Fax: 39-577-298-898

Ed Maruska
Cincinnati Zoo
3400 Vine Street
Cincinnati, OH 45220
Tel: 513-281-4701
Fax: 513-559-7791

Ann Petric
Chicago Zoological Park
3300 Golf Road
Brookfield, IL 60513
Tel: 708-485-0263
Fax: 708-485-3532

Karen Sausman
The Living Desert
47-900 Portola Avenue
Palm Desert, CA 92260
Tel: 619-346-5694
Fax: 619-568-9685

Conrad Schmitt
Cheyenne Mountain Zoo
4250 Cheyenne Mtn. Zoo Road
Colorado Springs, CO 80906-5728
Tel: 719-633-0917
Fax: 719-633-2254

Dr. David Shackleton
Department of Animal Science
University of British Columbia
Vancouver, British Columbia
Canada V6T 124
Deputy Director SSC IUCN
Tel: 604-822-6873
Fax: 604-822-4400
Home: 604-536-2524

Lee Werle
Woodland Park Zoological Gardens
5500 Phinney Avenue No.
Seattle, WA 98103
Tel: 206-684-4880
Fax: 206-684-4854

CAPRINAE

CONSERVATION ASSESSMENT AND MANAGEMENT PLAN (CAMP)

SECTION 4

REFERENCE MATERIALS

Essay

Assessing Extinction Threats: Toward a Reevaluation of IUCN Threatened Species Categories

GEORGINA M. MACE

Institute of Zoology
Zoological Society of London
Regent's Park, London NW1 4RY, U.K.

RUSSELL LANDE

Department of Ecology and Evolution
University of Chicago
Chicago, Illinois 60637, U.S.A.

Abstract: *IUCN categories of threat (Endangered, Vulnerable, Rare, Indeterminate, and others) are widely used in 'Red lists' of endangered species and have become an important tool in conservation action at international, national, regional, and thematic levels. The existing definitions are largely subjective, and as a result, categorizations made by different authorities differ and may not accurately reflect actual extinction risks. We present proposals to redefine categories in terms of the probability of extinction within a specific time period, based on the theory of extinction times for single populations and on meaningful time scales for conservation action. Three categories are proposed (CRITICAL, ENDANGERED, VULNERABLE) with decreasing levels of threat over increasing time scales for species estimated to have at least a 10% probability of extinction within 100 years. The process of assigning species to categories may need to vary among different taxonomic groups, but we present some simple qualitative criteria based on population biology theory, which we suggest are appropriate at least for most large vertebrates. The process of assessing threat is clearly distinguished from that of setting priorities for conservation action, and only the former is discussed here.*

Resumen: *La categorización de la Unión Internacional para la Conservación de la Naturaleza (UICN) de las especies amenazadas (en peligro, vulnerables, raras, indeterminadas y otras) son ampliamente utilizadas en las Listas Rojas de especies en peligro y se han convertido en una herramienta importante para las acciones de conservación al nivel internacional, nacional, regional y temático. Las definiciones de las categorías existentes son muy subjetivas y, como resultado, las categorizaciones hechas por diferentes autores difieren y quizás no reflejen con certeza el riesgo real de extinción. Presentamos propuestas para re-definir las categorías en términos de la probabilidad de extinción dentro de un período de tiempo específico. Las propuestas están basadas en la teoría del tiempo de extinción para poblaciones individuales y en escalas de tiempo que tengan significado para las acciones de conservación. Se proponen tres categorías (CRITICA, EN PELIGRO, VULNERABLE) con niveles decrecientes de amenaza sobre escalas de tiempo en aumento para especies que se estima tengan cuando ménos un 10% de probabilidad de extinción en 100 años. El proceso de asignar especies a categorías puede que necesite variar dentro de los diferentes grupos taxonómicos pero nosotros presentamos algunos criterios cualitativos simples basados en la teoría de la biología de las poblaciones, las cuales sugerimos son apropiadas para cuando ménos la mayoría de los grandes vertebrados. El proceso de evaluar la amenaza se distingue claramente del de definir las prioridades para las acciones de conservación, sólamente el primero se discute aquí.*

Paper submitted February 12, 1990; revised manuscript accepted October 8, 1990.

Introduction

Background

The Steering Committee of the Species Survival Commission (SSC) of the IUCN has initiated a review of the overall functioning of the Red Data Books. The review will cover three elements: (1) the form, format, content, and publication of Red Data Books; (2) the categories of threat used in Red Data Books and the IUCN Red List (Extinct, Endangered, Vulnerable, Rare, and Indeterminate); and (3) the system for assigning species to categories. This paper is concerned with the second element and includes proposals to improve the objectivity and scientific basis for the threatened species categories currently used in Red Data Books (see IUCN 1988 for current definitions).

There are at least three reasons why a review of the categorization system is now appropriate: (1) the existing system is somewhat circular in nature and excessively subjective. When practiced by a few people who are experienced with its use in a variety of contexts it can be a robust and workable system, but increasingly, different groups with particular regional or taxonomic interests are using the Red Data Book format to develop local or specific publications. Although this is generally of great benefit, the interpretation and use of the present threatened species categories are now diverging widely. This leads to disputes and uncertainties over particular species that are not easily resolved and that ultimately may negatively affect species conservation. (2) Increasingly, the categories of threat are being used in setting priorities for action, for example, through specialist group action plans (e.g., Oates 1986; Eudey 1988; East 1988, 1989; Schreiber et al. 1989). If the categories are to be used for planning then it is essential that the system used to establish the level of threat be consistent and clearly understood, which at present it does not seem to be. (3) A variety of recent developments in the study of population viability have resulted in techniques that can be helpful in assessing extinction risks.

Assessing Threats Versus Setting Priorities

In the first place it is important to distinguish systems for assessing threats of extinction from systems designed to help set priorities for action. The categories of threat should simply provide an assessment of the likelihood that if current circumstances prevail the species will go extinct within a given period of time. This should be a scientific assessment, which ideally should be completely objective. In contrast, a system for setting priorities for action will include the likelihood of extinction, but will also embrace numerous other factors, such as the likelihood that restorative action will be successful; economic, political, and logistical considerations; and perhaps the taxonomic distinctiveness of the species under review. Various categorization systems used in the past, and proposed more recently, have confounded these two processes (see Fitter & Fitter 1987; Munton 1987). To devise a general system for setting priorities is not useful because different concerns predominate within different taxonomic, ecological, geographical, and political units. The process of setting priorities is therefore best left to specific plans developed by specialist bodies such as the national and international agencies, the specialist groups, and other regional bodies that can devise priority assessments in the appropriate regional or taxonomic context. An objective assessment of extinction risk may also then contribute to the decisions taken by governments on which among a variety of recommendations to implement. The present paper is therefore confined to a discussion of assessing threats.

Aims of the System of Categorization

For Whom?

Holt (1987) identifies three different groups whose needs from Red Data Books (and therefore categories of threat) may not be mutually compatible: the lay public, national and international legislators, and conservation professionals. In each case the purpose is to highlight taxa with a high extinction risk, but there are differences in the quality and quantity of information needed to support the assessment. Scott et al. (1987) make the point that in many cases simple inclusion in a Red Data Book has had as much effect on raising awareness as any of the supporting data (see also Fitter 1974). Legislators need a simple, but objective and soundly based system because this is most easily incorporated into legislation (Bean 1987). Legislators frequently require some statement about status for every case they consider, however weak the available information might be. Inevitably, therefore, there is a conflict between expediency and the desire for scientific credibility and objectivity. Conservationists generally require more precision, particularly if they are involved in planning conservation programs that aim to make maximal use of limited resources.

Characteristics of an Ideal System

With this multiplicity of purposes in mind it is appropriate to consider various characteristics of an ideal system:

(1) The system should be essentially simple, providing easily assimilated data on the risk of extinction. In terms of assessing risk, there seems to be little virtue in developing numerous categories, or in categorizing risk on the basis of a range of different parameters (e.g., abundance, nature of threat, likelihood of persistence of threat, etc.). The categories should be few in number,

should have a clear relationship to one another (Holt 1987; Munton 1987), and should be based around a probabilistic assessment of extinction risk.

(2) The system for categorization has to be flexible in terms of data required. The nature and amount of data available to assess extinction risks varies widely from almost none (in the vast majority of species) to highly detailed population data (in a very few cases). The categorization system should make maximum use of whatever data are available. One beneficial consequence of this process would be to identify key population data for field workers to collect that would be useful in assessing extinction risk.

(3) The categorization system also needs to be flexible in terms of the population unit to which it applies. Throughout this discussion, it is assumed that the system being developed will apply to any species, subspecies, or geographically separate population. The categorization system therefore needs to be equally applicable to limited lower taxonomic levels and to more limited geographical scope. Action planning will need to be focused on particular taxonomic groups or geographical areas, and can then incorporate an additional system for setting priorities that reflect taxonomic distinctiveness and extinction risks outside the local area (e.g., see East 1988, 1989; Schreiber et al. 1989).

(4) The terminology used in categorization should be appropriate, and the various terms used should have a clear relationship to each other. For example, among the current terms both 'endangered' and 'vulnerable' are readily comprehended, but 'rare' is confusing. It can be interpreted as a statement about distribution status, level of threat, or local population size, and the relationships between these factors are complex (Rabinowitz et al. 1986). Rare (i.e., low-density) species are not always at risk and many species at risk are not numerically rare (King 1987; Munton 1987; Heywood 1988). The relationship of 'rare' to 'endangered' and 'vulnerable' is also unclear.

(5) If the system is to be objectively based upon sound scientific principles, it should include some assessment of uncertainty. This might be in terms of confidence levels, sensitivity analyses, or, most simply, on an ordinal scale reflecting the adequacy of the data and models in any particular case.

(6) The categories should incorporate a time scale. On a geological time scale all species are doomed to extinction, so terms such as "in danger of extinction" are rather meaningless. The concern we are addressing here is the high background level of the current rates of extinction, and one aim is therefore preservation over the upcoming centuries (Soulé & Simberloff 1986). Therefore, the probability of extinction should be expressed in terms of a finite time scale, for example, 100 years. Munton (1987) suggests using a measure of number of years until extinction. However, since most models of population extinction times result in approximately exponential distributions, as in Goodman's (1987) model of density-dependent population growth in a fluctuating environment, mean extinction time may not accurately reflect the high probability that the species will go extinct within a time period considerably shorter than the mean (see Fig. 1). More useful are measures such as "95% likelihood of persistence for 100 years."

Population Viability Analysis and Extinction Factors

Various approaches to defining viable populations have been taken recently (Shaffer 1981, 1990; Gilpin & Soulé, 1986; Soulé 1987). These have emphasized that there is no simple solution to the question of what constitutes a viable population. Rather, through an analysis of extinction factors and their interactions it is possible to assess probabilities and time scales for population persistence for a particular taxon at a particular time and place. The development of population viability analyses has led to the definition of intrinsic and extrinsic factors that determine extinction risks (see Soulé 1983; Soulé 1987; Gilpin & Soulé 1986; see also King 1987). Briefly these can be summarized as population dynamics (number of individuals, life history and age or stage distribution, geographic structure, growth rate, variation in demographic parameters), population characteristics (morphology, physiology, genetic variation, behavior and dispersal patterns), and environmental effects (habitat quality and quantity, patterns and rates of environmental disturbance and change, interactions with other species including man).

Preliminary models are available to assess a population's expected persistence under various extinction pressures, for example, demographic variation (Goodman 1987*a*, *b*; Belovsky 1987; CBSG 1989), catastrophes (Shaffer 1987), inbreeding and loss of genetic diversity (Lande & Barrowclough 1987; Lacy 1987), metapopulation structure (Gilpin 1987; Quinn & Hastings 1987; Murphy et al. 1990). In addition, various approaches have been made to modeling extinction in populations threatened by habitat loss (e.g., Gutiérrez & Carey 1985; Maguire et al. 1987; Lande 1988), disease (e.g., Anderson & May 1979; Dobson & May 1986; Seal et al. 1989), parasites (e.g., May & Anderson 1979; May & Robinson 1985; Dobson & May 1986), competitors, poaching (e.g., Caughley 1988), and harvesting or hunting (e.g., Holt 1987).

So far, the development of these models has been rather limited, and in particular they often fail to successfully incorporate several different extinction factors and their interactions (Lande 1988). Nevertheless the approach has been applied in particular cases even with

existing models (e.g., grizzly bear: Shaffer 1983; spotted owl: Gutiérrez & Carey 1985; Florida panther: CBSG 1989), and there is much potential for further development.

Although different extinction factors may be critical for different species, other, noncritical factors cannot be ignored. For example, it seems likely that for many species, habitat loss constitutes the most immediate threat. However, simply preserving habitats may not be sufficient to permit long term persistence if surviving populations are small and subdivided and therefore have a high probability of extinction from demographic or genetic causes. Extinction factors may also have cumulative or synergistic effects; for example, the hunting of a species may not have been a problem before the population was fragmented by habitat loss. In every case, therefore, all the various extinction factors and their interactions need to be considered. To this end more attention needs to be directed toward development of models that reflect the random influences that are significant to most populations, that incorporate the effects of many different factors, and that relate to the many plant, invertebrate, and lower vertebrate species whose population biology has only rarely been considered so far by these methods.

Viability analysis should suggest the appropriate kind of data for assigning extinction risks to species, though much additional effort will be needed to develop appropriate models and collect appropriate field data.

Proposal

Three Categories and Their Justification

We propose the recognition of three categories of threat (plus EXTINCT), defined as follows:

CRITICAL:	50% probability of extinction within 5 years or 2 generations, whichever is longer.
ENDANGERED:	20% probability of extinction within 20 years or 10 generations, whichever is longer.
VULNERABLE:	10% probability of extinction within 100 years.

These definitions are based on a consideration of the theory of extinction times for single populations as well as on meaningful time scales for conservation action. If biological diversity is to be maintained for the foreseeable future at anywhere near recent levels occurring in natural ecosystems, fairly stringent criteria must be adopted for the lowest level of extinction risk, which we call VULNERABLE. A 10% probability of extinction within 100 years has been suggested as the highest level of risk that is biologically acceptable (Shaffer 1981) and seems appropriate for this category. Furthermore, events more than about 100 years in the future are hard to foresee, and this may be the longest duration that legislative systems are capable of dealing with effectively.

It seems desirable to establish a CRITICAL category to emphasize that some species or populations have a very high risk of extinction in the immediate future. We propose that this category include species or populations with a 50% chance of extinction within 5 years or two generations, and which are clearly at very high risk.

An intermediate category, ENDANGERED, seems desirable to focus attention on species or populations that are in substantial danger of extinction within our lifetimes. A 20% chance of extinction within 20 years or 10 generations seems to be appropriate in this context.

For increasing levels of risk represented by the categories VULNERABLE, ENDANGERED, and CRITICAL, it is necessary to increase the probability of extinction or to decrease the time scale, or both. We have chosen to do both for the following reasons. First, as already mentioned, decreasing the time scale emphasizes the immediacy of the situation. Ideally, the time scale should be expressed in natural biological units of generation time of the species or population (Leslie 1966), but there is also a natural time scale for human activities such as conservation efforts, so we have given time scales in years and in generations for the CRITICAL and ENDANGERED categories.

Second, the uncertainty of estimates of extinction probabilities decreases with increasing risk levels. In population models incorporating fluctuating environments and catastrophes, the probability distribution of extinction times is approximately exponential (Nobile et al. 1985; Goodman 1987). In a fluctuating environment where a population can become extinct only through a series of unfavorable events, there is an initial, relatively brief period in which the chance of extinction is near zero, as in the inverse Gaussian distribution of extinction times for density-independent fluctuations (Ginzburg et al. 1982; Lande & Orzack 1988). If catastrophes that can extinguish the population occur with probability p per unit time, and are much more important than normal environmental fluctuations, the probability distribution of extinction times is approximately exponential, pe^{-pt}, and the cumulative probability of extinction up to time t is approximately $1 - e^{-pt}$. Thus, typical probability distributions of extinction times look like the curves in Figures 1A and 1B, and the cumulative probabilities of extinction up to any given time look like the curves in Figures 1C and 1D. Dashed curves represent different distributions of extinction times and cumulative extinction probabilities obtained by changing the model parameters in a formal population viability analysis (e.g., different amounts of environmental variation in demographic parameters). The uncertainty in an

estimate of cumulative extinction probability up to a certain time can be measured by its coefficient of variation, that is, the standard deviation among different estimates of the cumulative extinction probability with respect to reasonable variation in model parameters, divided by the best estimate. It is apparent from Figures 1C and 1D that at least for small variations in the parameters (if the parameters are reasonably well known), the uncertainty of estimates of cumulative extinction probability at particular times decreases as the level of risk increases. Thus at times, t_1, t_2, and t_3 when the best estimates of the cumulative extinction probabilities are 10%, 20%, and 50% respectively, the corresponding ranges of extinction probabilities in Figure 1C are 6.5%–14.8%, 13.2%–28.6%, and 35.1%–65.0%, and in Figure 1D are 6.8%–13.1%, 13.9%–25.7%, and 37.2%–60.2%. Taking half the range as a rough approximation of the standard deviation in this simple illustration gives uncertainty measures of 0.41, 0.38, and 0.30 in Figure 1C, and 0.31, 0.29, and 0.23 in Figure 1D, corresponding to the three levels of risk. Given that for practical reasons we have chosen to shorten the time scales for the more threatened categories, these results suggest that to maintain low levels of uncertainty, we should also increase the probabilities of extinction in the definition of the ENDANGERED and CRITICAL categories.

These definitions are based on general principles of population biology with broad applicability, and we believe them to be appropriate across a wide range of life forms. Although we expect the process of assigning species to categories (see below) to be an evolving (though closely controlled and monitored) process, and one that might vary across broad taxonomic groups, we recommend that the definitions be constant both across taxonomic groups and over time.

Assigning Species or Populations to Categories

We recognize that in most cases, there are insufficient data and imperfect models on which to base a formal probabilistic analysis. Even when considerable information does exist there may be substantial uncertainties in the extinction risks obtained from population models containing many parameters that are difficult to estimate accurately. Parameters such as environmental stochasticity (temporal fluctuations in demographic parameters such as age- or developmental stage–specific mortality and fertility rates), rare catastrophic events, as well as inbreeding depression and genetic variability in particular characters required for adaptation are all difficult to estimate accurately. Therefore it may not be possible to do an accurate probabilistic viability analysis even for some very well studied species. We suggest that the categorization of many species should be based on more qualitative criteria derived from the same body of theory as the definitions above, which will broaden the scope and applicability of the categorization system. In these more qualitative criteria we use measures of effective population size (N_e) and give approximate equivalents in actual population size (N). It is important to recognize that the relationship between N_e and N depends upon a variety of interacting factors. Estimating N_e for a particular population will require quite extensive information on breeding structure and life history characteristics of the population and may then produce only an approximate figure (Lande & Barrowclough 1987). In addition, different methods of estimating N_e will give variable results (Harris & Allendorf 1989). N_e/N ratios vary widely across species, but are typically in the range 0.2 to 0.5. In the criteria below we give a value for N_e as well as an approximate value of N assuming that the N_e/N ratio is 0.2.

We suggest the following criteria for the three categories:

CRITICAL: 50% probability of extinction within 5 years or 2 generations, whichever is longer, or

(1) Any **two** of the following criteria:
- (a) Total population $N_e < 50$ (corresponding to actual $N < 250$).
- (b) Population fragmented: ≤2 subpopulations with $N_e > 25$ ($N > 125$) with immigration rates <1 per generation.
- (c) Census data of >20% annual decline in numbers over the past 2 years, or >50% decline in the last generation, or equivalent projected declines based on demographic projections after allowing for known cycles.
- (d) Population subject to catastrophic crashes (>50% reduction) per 5 to 10 years, or 2 to 4 generations, with subpopulations highly correlated in their fluctuations.

or (2) Observed, inferred, or projected habitat alteration (i.e., degradation, loss, or fragmentation) resulting in characteristics of (1).

or (3) Observed, inferred, or projected commercial exploitation or ecological interactions with introduced species (predators, competitors, pathogens, or parasites) resulting in characteristics of (1).

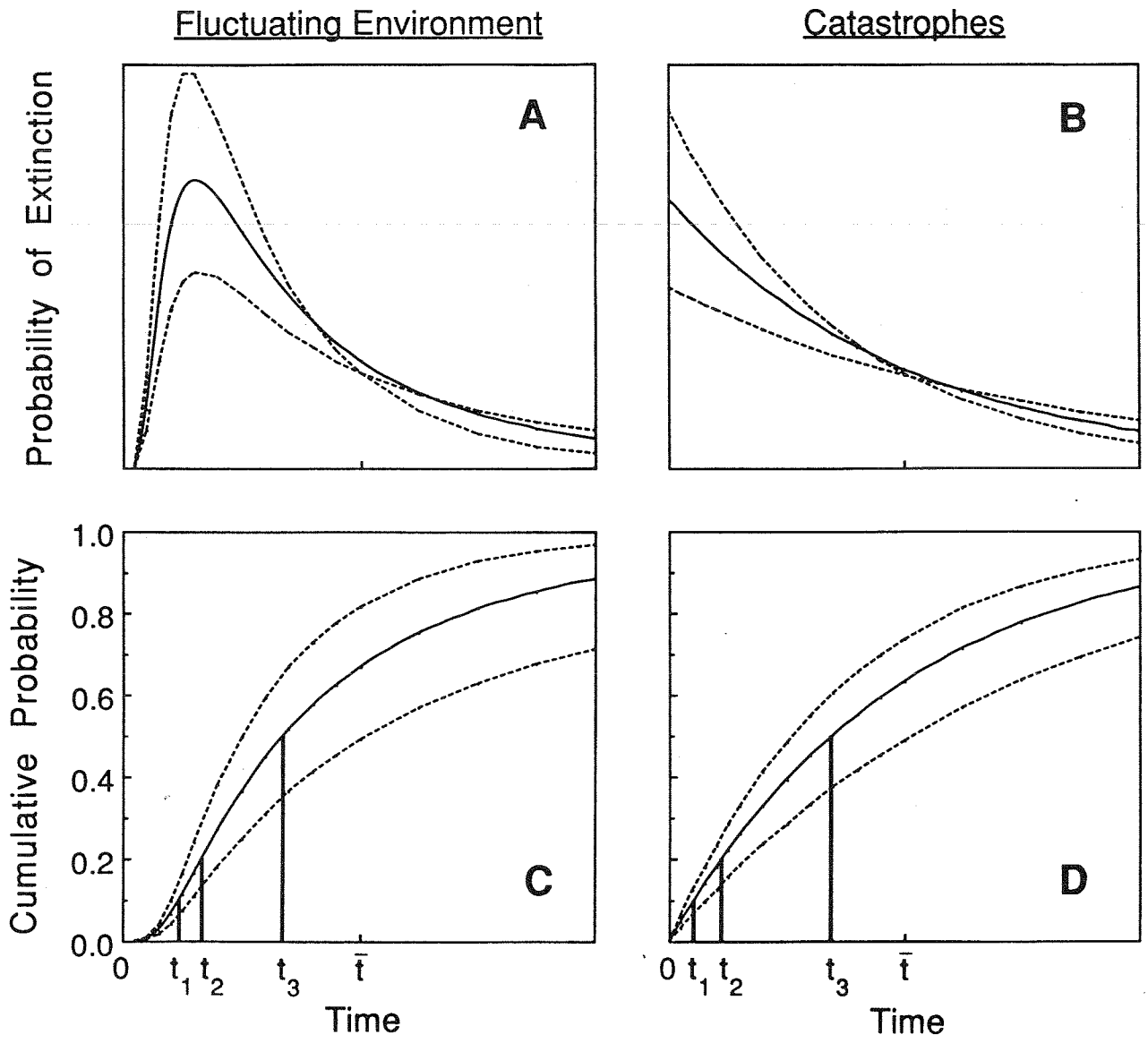

Figure 1. Probability distributions of time to extinction in a fluctuating environment, inverse Gaussian distributions (A), or with catastrophes, exponential distributions (B). Corresponding cumulative extinction probabilities of extinction up to any given time are shown below (C and D). Solid curves represent the best estimates from available data and dashed curves represent different estimates based upon the likely range of variation in the parameters. t_1, t_2, and t_3 are times at which the best estimates of cumulative extinction probabilities are 10%, 20%, and 50%. $\bar{t}$ is the expected time to extinction in the solid curves.

ENDANGERED:

20% probability of extinction within 20 years or 10 generations, whichever is longer, or

(1) Any **two** of the following or any **one** criterion under CRITICAL

(a) Total population $N_e < 500$ (corresponding to actual $N < 2,500$).

(b) Population fragmented:

(i) ≤ 5 subpopulations with $N_e > 100$ ($N > 500$) with immigration rates <1 per generation, or

(ii) ≤ 2 subpopulations with $N_e > 250$ ($N > 1,250$) with immigration rates <1 per generation.

(c) Census data of $>5\%$ annual decline in numbers over past 5 years, or $>10\%$ decline per generation over past 2 generations, or equivalent projected declines based on demographic data after

allowing for known cycles.

(d) Population subject to catastrophic crashes: an average of >20% reduction per 5 to 10 years or 2 to 4 generations, or >50% reduction per 10 to 20 years or 5 to 10 generations, with subpopulations strongly correlated in their fluctuations.

or (2) Observed, inferred, or projected habitat alteration (i.e., degradation, loss, or fragmentation) resulting in characteristics of (1).

or (3) Observed, inferred, or projected commercial exploitation or ecological interactions with introduced species (predators, competitors, pathogens, or parasites) resulting in characteristics of (1).

VULNERABLE:

10% probability of extinction within 100 years, or

(1) Any **two** of the following criteria or any **one** criterion under ENDANGERED.

(a) Total population N_e < 2,000 (corresponding to actual N < 10,000).

(b) Population fragmented:
(i) ≤5 subpopulations with N_e > 500 (N > 2,500) with immigration rates <1 per generation, or
(ii) ≤2 subpopulations with N_e > 1,000 (N > 5,000) with immigration rates <1 per generation.

(c) Census data of >1% annual decline in numbers over past 10 years, or equivalent projected declines based on demographic data after allowing for known cycles.

(d) Population subject to catastrophic crashes: an average of >10% reduction per 5 to 10 years, >20% reduction per 10 to 20 years, or >50% reduction per 50 years, with subpopulations strongly correlated in their fluctuations.

or (2) Observed, inferred, or projected habitat alteration (i.e., degradation, loss, or fragmentation) resulting in characteristics of (1).

or (3) Observed, inferred, or projected commercial exploitation or ecological interactions with introduced species (predators, competitors, pathogens, or parasites) resulting in characteristics of (1).

Prior to any general acceptance, we recommend that these criteria be assessed by comparison of the categorizations they lead to in particular cases with the results of formal viability analyses, and categorizations based on existing methods. This process should help to resolve uncertainties about both the practice of, and results from, our proposals. We expect a system such as this to be relatively robust and of widespread applicability, at the very least for most higher vertebrates. For some invertebrate and plant taxa, different kinds of criteria will need to be developed within the framework of the definitions above. For example, many of these species have very high rates of population growth, short generation times, marked or episodic fluctuations in population size, and high habitat specificity. Under these circumstances, it will be more important to incorporate metapopulation characteristics such as subpopulation persistence times, colonization rates, and the distribution and persistence of suitable habitats into the analysis, which are less significant for most large vertebrate populations (Murphy et al. 1990; Menges 1990).

Change of Status

The status of a population or species with respect to risk of extinction should be up-listed (from unlisted to VULNERABLE, from VULNERABLE to ENDANGERED, or from ENDANGERED to CRITICAL) as soon as current information suggests that the criteria are met. The status of a population or species with respect to risk of extinction should be down-listed (from CRITICAL to ENDANGERED, from ENDANGERED to VULNERABLE, or from VULNERABLE to unlisted) only when the criteria of the lower risk category have been satisfied for a time period equal to that spent in the original category, or if it is shown that past data were inaccurate.

For example, if an isolated population is discovered consisting of 500 individuals and no other information is available on its demography, ecology, or the history of the population or its habitat, this population would initially be classified as ENDANGERED. If management efforts, natural events, or both caused the population to increase so that 10 years later it satisfied the criteria of the VULNERABLE category, the population would not be removed from the ENDANGERED category for a further period of 10 years. This time lag in down-listing prevents frequent up-listing and down-listing of a population or species.

Uncertain or Conflicting Results

Because of uncertainties in parameter estimates, especially those dealing with genetics and environmental

variability and catastrophes, substantial differences may arise in the results from analyses of equal validity performed by different parties. In such cases, we recommend that the criteria for categorizing a species or population should revert to the more qualitative ones outlined above.

Reporting Categories of Threat

To objectively compare categorizations made by different investigators and at different times, we recommend that any published categorization also cite the method used, the source of the data, a date when the data were accurate, and the name of the investigator who made the categorization. If the method was by a formal viability model, then the name and version of the model used should also be included.

Conclusion

Any system of categorizing degrees of threat of extinction inevitably contains arbitrary elements. No single system can adequately cover every possibility for all species. The system we describe here has the advantage of being based on general principles from population biology and can be used to categorize species for which either very little or a great deal of information is available. Although this system may be improved in the future, we feel that its use will help to promote a more uniform recognition of species and populations at risk of premature extinction, and should thereby aid in setting priorities for conservation efforts.

Summary

1. Threatened species categories should highlight species vulnerable to extinction and focus appropriate reaction. They should therefore aim to provide objective, scientifically based assessments of extinction risks.
2. The audience for Red Data Books is diverse. Positive steps to raise public awareness and implement national and international legislation benefit from simple but soundly based categorization systems. More precise information is needed for planning by conservation bodies.
3. An ideal system needs to be simple but flexible in terms of data required. The category definitions should be based on a probabilistic assessment of extinction risk over a specified time interval, including an estimate of error.
4. Definitions of categories are appropriately based on extinction probabilities such as those arising from population viability analysis methods.
5. We recommend three categories, CRITICAL, ENDANGERED, and VULNERABLE, with decreasing probabilities of extinction risk over increasing time periods.
6. For most cases, we recommend development of more qualitative criteria for allocation to categories based on basic principles of population biology. We present some criteria that we believe to be appropriate for many taxa, but are appropriate at least for higher vertebrates.

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