

Global Captive Action Plan for Cervids

San Diego, CA

18 - 20 March 1993

A collaborative workshop

Sponsored by

The Zoological Society of San Diego



IUCN/SSC Captive Breeding Specialist Group

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Kew Royal Botanic Gardens
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Potter Park Zoo
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Natal Parks Board
Oglebay's Good Children's Zoo
Safari Park
Speedwell Bird Sanctuary
Ueno Zoological Gardens
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GLOBAL

CAPTIVE ACTION PLAN

FOR

CERVIDS

TABLE OF CONTENTS

GLOSSARY OF GLOBAL & REGIONAL CAPTIVE PROGRAMS	SECTION 1
ISIS ABSTRACT	SECTION 2
ISIS TAG REPORT	SECTION 3
CERVID CAMP SPREADSHEETS	SECTION 4
CERVID GCAP TABLES (BLANK)	SECTION 5
ROUGH DRAFT ACTION PLAN FOR CERVIDS	SECTION 6

GLOBAL

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BRIEFING BOOK

SECTION 1

GLOSSARY OF GLOBAL & REGIONAL CAPTIVE PROGRAMS

GLOSSARY OF GLOBAL & REGIONAL CAPTIVE STRATEGIC PROGRAMS

CAMP A Conservation Assessment and Management Plan (CAMP):

- (1) reviews the wild and captive status of each taxon in a defined broad group of taxa (e.g. an order, family, subfamily, community);
- (2) assesses the degree of threat for each taxon according to the Mace/Lande categories;
- (3) recommends intensive management and information collection action to mitigate threat: PHVAs, *in situ* management, conservation oriented research (surveys, taxonomy, etc.) captive breeding, genome banking.

CAMPs are developed as collaborative efforts of the Captive Breeding Specialist Group and the other Specialist Groups of the SSC and ICBP, wildlife agencies, and the Regional Captive Programs.

A CAMP provides:

- (1) a resource for the development of IUCN SSC and ICBP Action Plans;
- (2) a strategic guide for intensive conservation action;
- (3) the first step in the Global Captive Action Plan (GCAP) process.

A CAMP considers multiple taxa.

GCAP A Global Captive Action Plan (GCAP) also considers a broad group of taxa and:

- (1) recommends:
 - (A) which taxa in captivity should remain there;
 - (B) which taxa in captivity need not be maintained there for conservation reasons;
 - (C) which taxa not yet in captivity should be there to assist conservation efforts;
- (2) proposes a level of captive breeding program in terms of genetic and demographic objectives which translate into recommendations about global captive target populations;
- (3) suggests how responsibilities for captive program might be distributed among the Regional Programs, i.e. this function translates into recommendations for regional captive target populations;
- (4) identifies priorities for technology transfer to and for financial and other support for *in situ* conservation.

GCAPs are developed by a Working Group which consists of representatives of the Regional Programs, especially the Chairs and selected members of the Taxon Advisory Groups (TAGs), with advice and facilitation from the IUCN SSC Captive Breeding Specialist Group (CBSG). The GCAP Working Group will also normally include representatives of the range-country wildlife community and scientists who can resolve problems of systematics. A CAMP can provide a first step of the GCAP process. The GCAP is developed further in an interactive and iterative process involving the Regional Programs and their own Regional Strategic Collection Plans (RSCPs). The GCAP is a dynamic process and mechanism that enables the Regional Programs to coordinate development of their Regional Strategic Collection Plans (RSCPs) in response to the conservation needs of taxa (as identified initially by the CAMP) but also to the circumstances and interests of the regions. Hence the GCAP is a facilitation and forum for the regional programs to integrate themselves into the best global conservation effort possible.

A GCAP considers multiple taxa.

RSCP A Regional Strategic Collection Plan (RSCP) is a set of recommendations developed by a Regional Taxon Advisory Group (TAG) on the taxa in a defined broad group for which Regional Captive Propagation Programs (RCPP) should be developed. An Regional TAG will consider the recommendations of the CAMP and initial GCAP as one factor in preparing the first drafts of the RSCP. However, the RSCP also considers other factors such as the realities of Regional space and resources in the Region as well as other interests the Region may have in maintaining taxa. As stated above, the GCAPs and RSCPs are interactively and iteratively developed in an effort to maximize effectiveness in using captive space and resources for taxa in need of captive programs for their conservation. An extension of the RSCP for defined broad groups of taxa is an overall strategic collection plan for all organisms to be maintained by institutions participating in the Regional Program. The Australasian Region has already embarked on this kind of overall strategic collection plan.

An RSCP considers multiple taxa.

ICP An Institutional Collection Plan is a strategic design for the taxa that a particular zoo, aquarium, or other captive facility will maintain and propagate. Ideally, an ICP will develop its collection to contribute as much as possible to RSCPs and ultimately GCAPs.

TAG A Taxon Advisory Group is a committee which is formed within the organized Regions of the Zoo/Aquarium World and which consists of zoo professionals and other experts. A primary function of a TAG is to formulate and implement Regional Strategic Collection Plans and by extension development of the GCAP. TAGs also recommend priorities for establishment of studbooks, development of Regional Captive Propagation programs, and research priorities.

A TAG considers multiple taxa.

RCPP A Regional Captive Propagation Program (RCPP) is one of the organized collaborative programs within a Region to breed and manage a designated, usually threatened, taxon. Examples include an AAZPA SSP in North America, an EEP in Europe, a JMSP in the U.K., an ASMP in Australasia, an SSCJ in Japan, an IESBP in India, an APP in Sub-Saharan Africa. Other Regions are initiating similar programs. RCPPs develop Regional Masterplans for propagation and management of the taxon.

An RCPP normally considers a single taxon (e.g. a species).

GASP A Global Animal Survival Plan (GASP) is a program for management and propagation of a single taxon at the international level. A GASP provides the facilitating framework for the Regional Captive Propagation Programs

- (1) to adopt global goals, in part by considering CAMP and GCAP recommendations,
- (2) to divide responsibility, e.g. especially target population sizes, for achieving the global goals among the Regional Programs.
- (3) to arrange interactions, especially animal or germplasm exchanges, among the Regional Breeding Programs toward achieving global and regional goals.

Analogous to the RCPP, a GASP develops a global masterplan to guide propagation and management of the taxon at the international level.

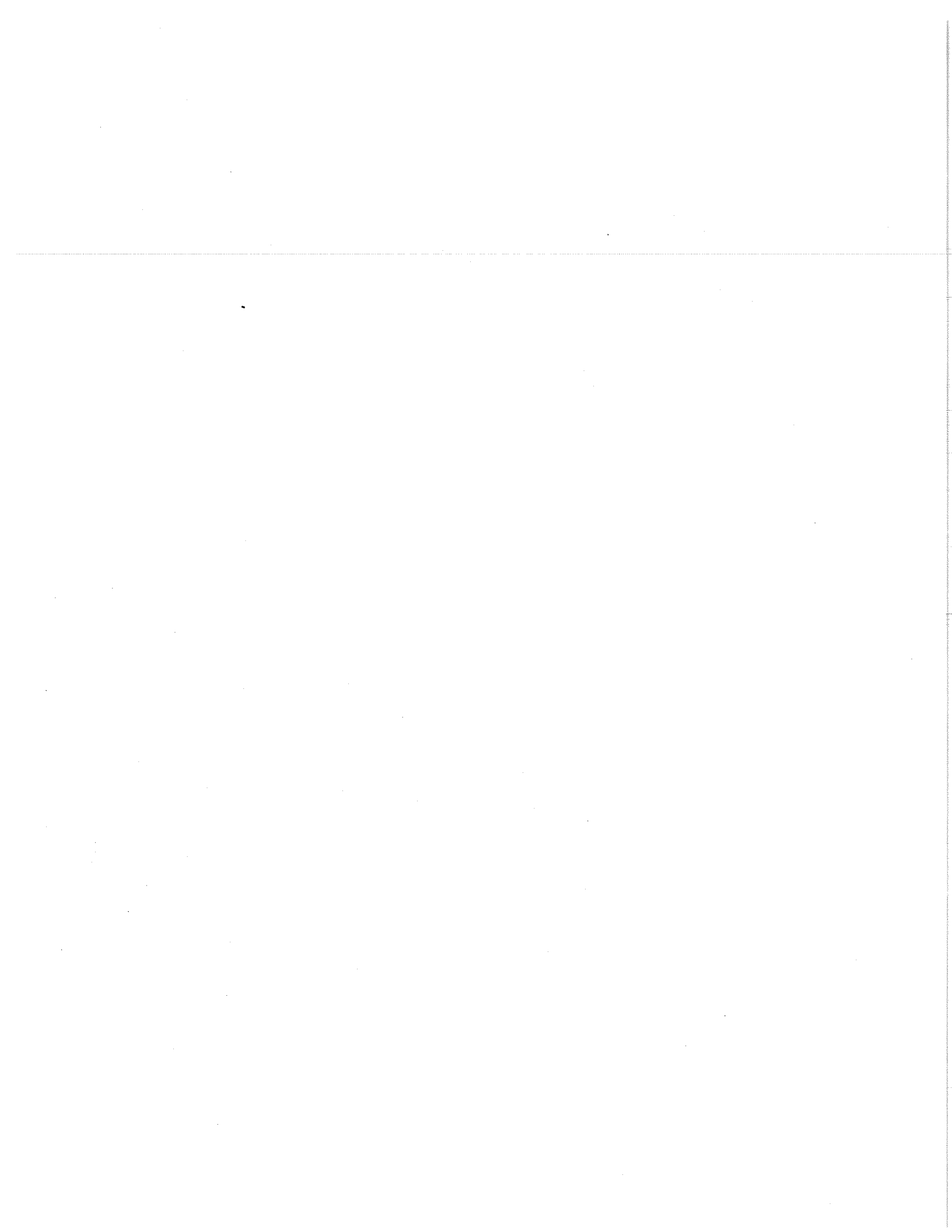
A GASP normally considers a single taxon.

PHVA A Population and Habitat Viability Analysis (PHVA) is an intensive analysis of a particular taxon or one of its populations. PHVA's use computer models:

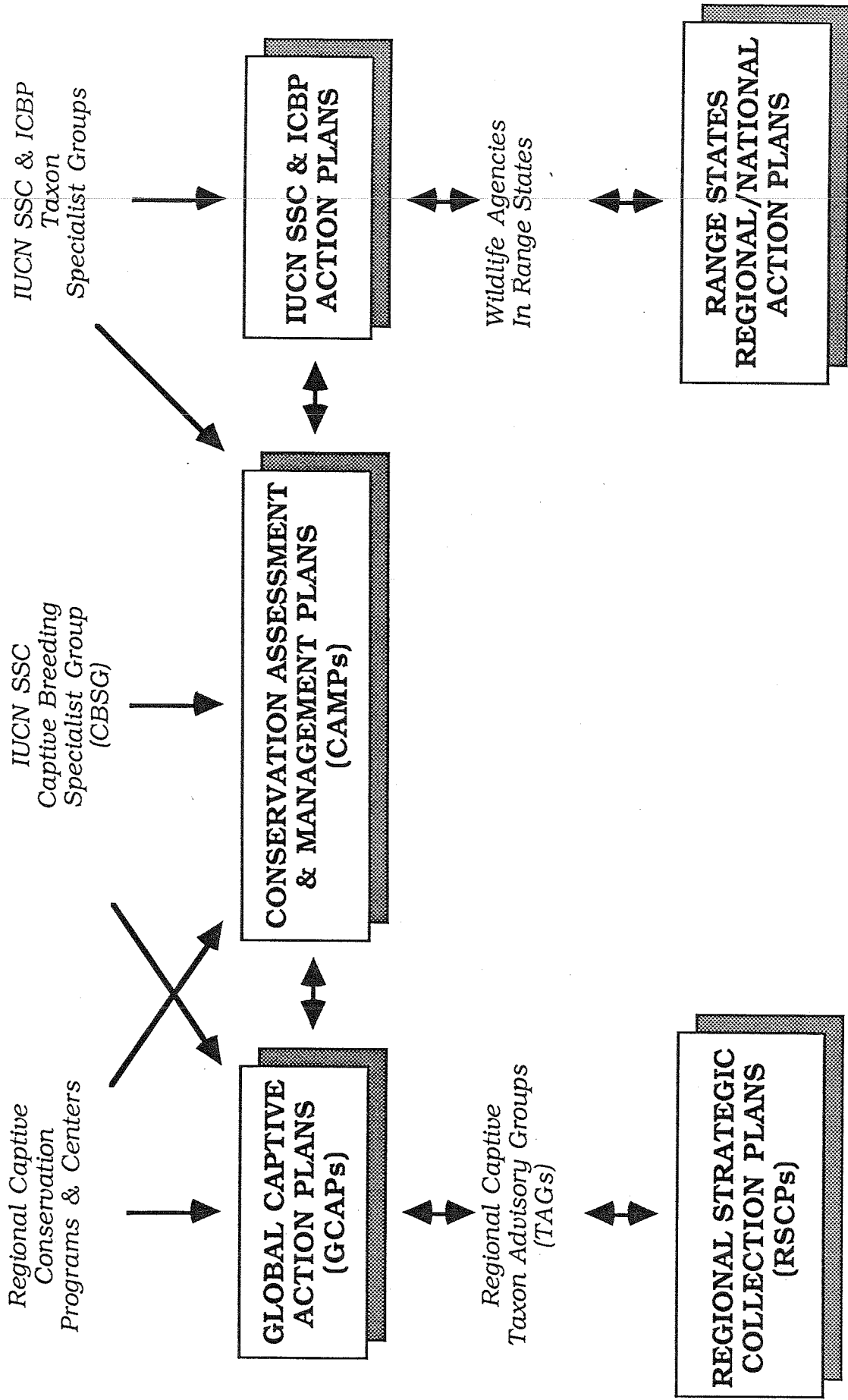
- (1) to explore extinction processes that operate on small and often fragmented populations of threatened taxa
- (2) to examine the probable consequences for the viability of the population of various management actions or inactions.

The models incorporate information on distributional, demographic, and genetic characteristics of the population and on conditions in the environment to simulate probable fates (especially probability of extinction and loss of genetic variation) under these circumstances. PHVAs use models to evaluate a range of scenarios for the populations under a variety of management (or non-management) regimes. As a result of the different scenarios modelled, it is possible to recommend management actions that maximize the probability of survival or recovery of the population. The management actions may include: establishment, enlargement, or more management of protected areas; poaching control; reintroduction or translocation; sustainable use programs; education efforts; captive breeding.

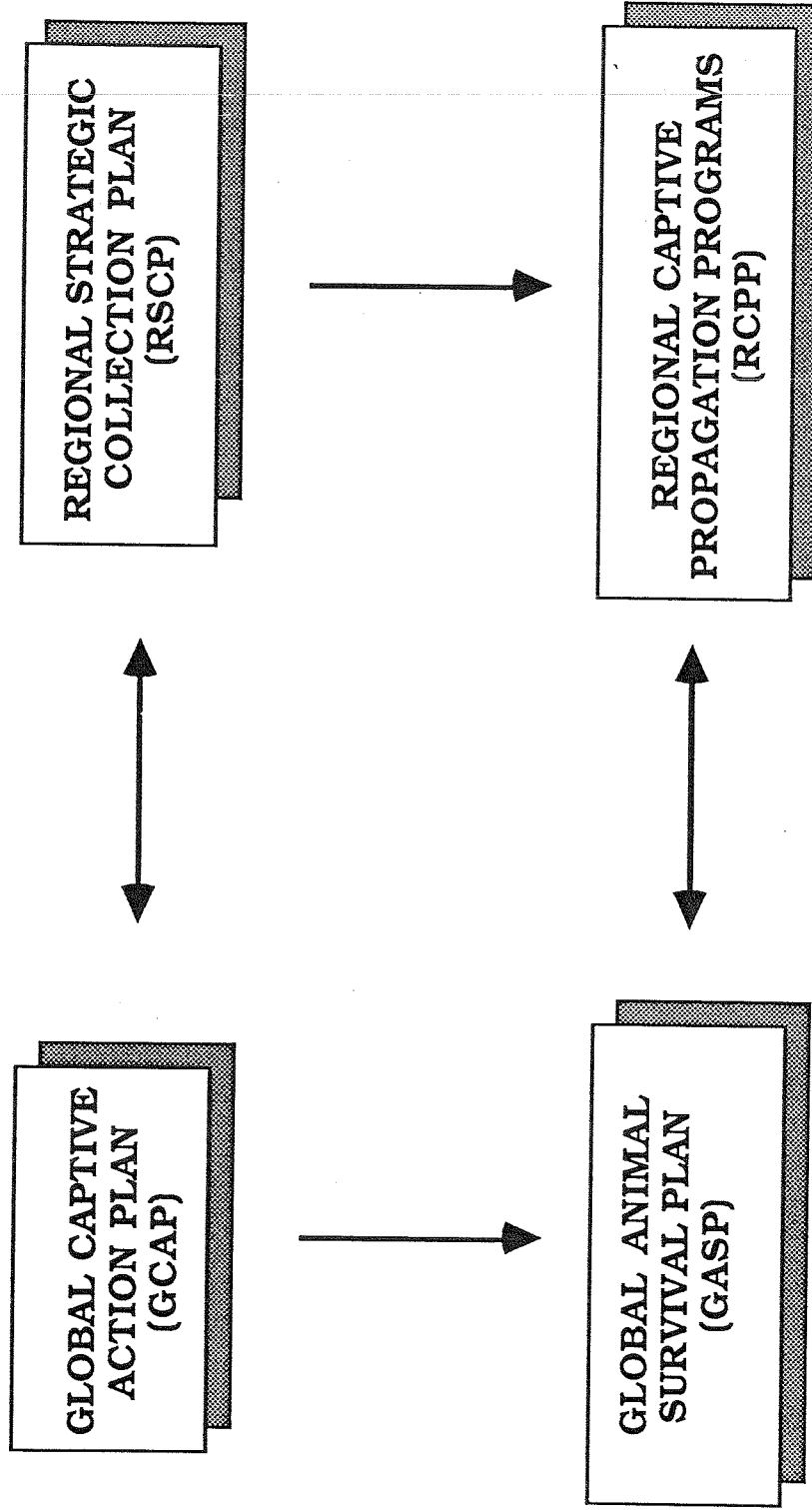
A PHVA normally considers one taxon at a time.



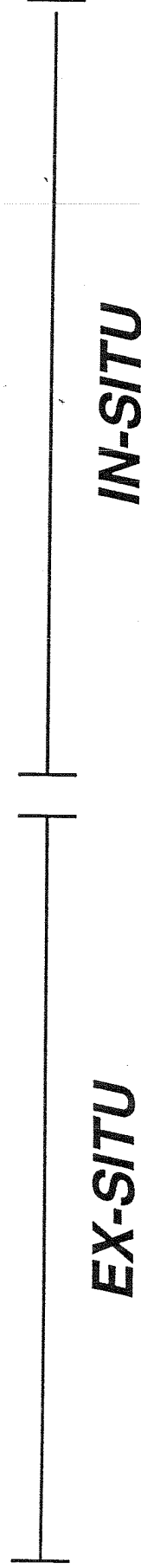
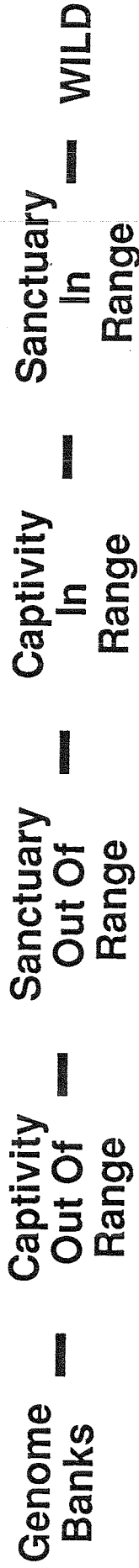
GLOBAL AND REGIONAL STRATEGIC CONSERVATION ACTION PLANS



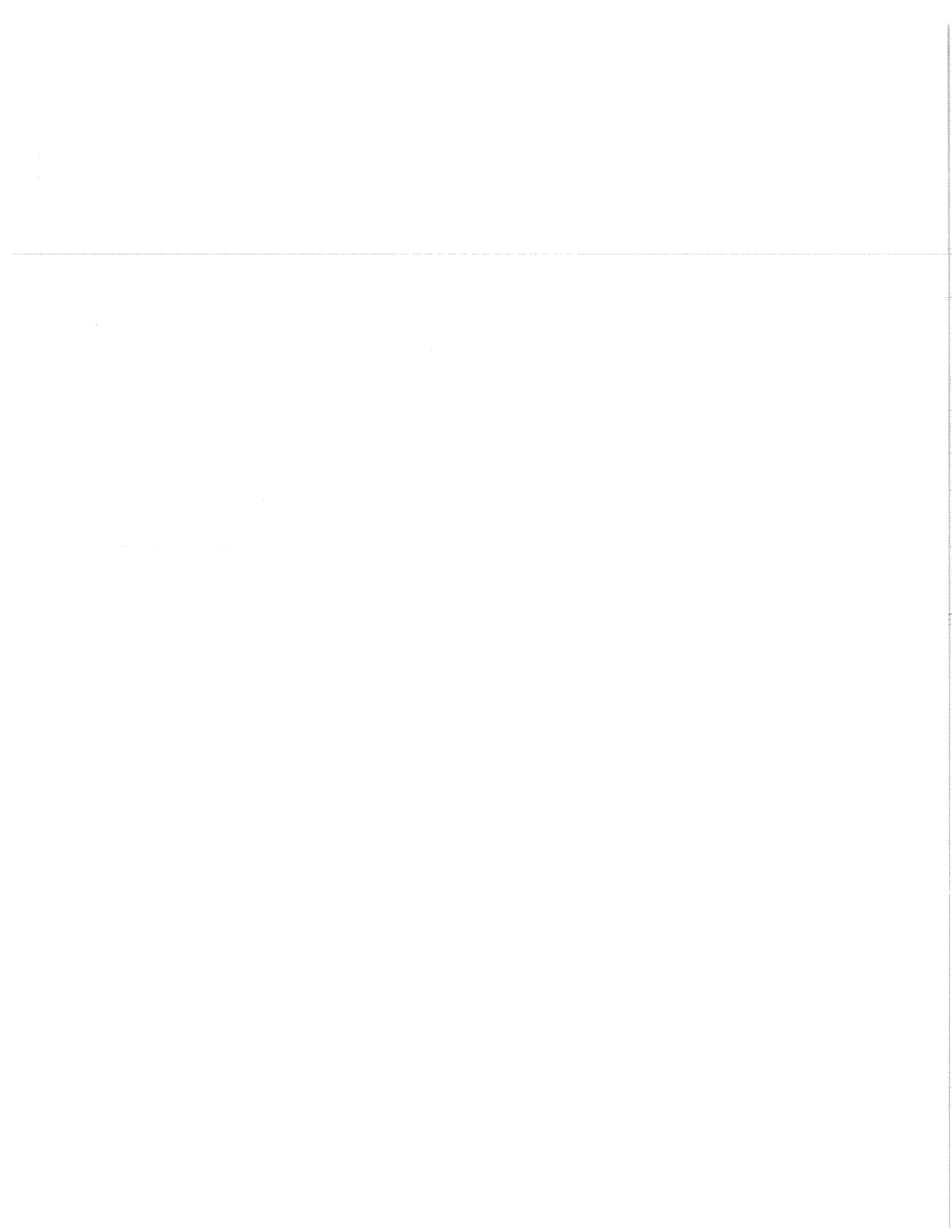
GLOBAL AND REGIONAL CAPTIVE PROPAGATION PROGRAMS



OPTIONS FOR WILDLIFE CONSERVATION



Modified from Mark Stanley Price (1991)



GLOBAL

CAPTIVE ACTION PLAN

FOR

CERVIDS

San Diego, CA
18 - 20 March 1993

BRIEFING BOOK

SECTION 2
ISIS ABSTRACT

AALBORG 2. 1. 0(1) AMSTERDAM 4. 5. 5(3) ANTWERP 1. 0. 0(0) ARNHEM 2. 1. 2(2) FRANKFURT 1. 3. 1(0) ROTTERDAM 2. 1. 0(0)
 ZURICH 3. 5. 0(3) SANDIEGOZ 0. 1. 0(0)

Total held: 15.17.8 Number of institutions: 8 Captive Born:100% Wild Born: 0% Captive births last 12 months: 9
Tragulus javanicus javanicus/LESSER MALAY CHEVROTAIN/
 SANDIEGOZ 1. 2. 0(1)

Total held: 1.2.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 1
Tragulus napu (no subsp)/LARGER MALAYAN CHEVROTAIN/
 CINCINNAT 1. 1. 0(0) MILWAUKEE 1. 0. 0(0) MINNESOTA 3. 5. 1(1) NY BRONX 8. 12. 0(0)

Total held: 13.18.1 Number of institutions: 4 Captive Born: 91% Wild Born: 9% Captive births last 12 months: 1
Tragulus napu napu/LARGER MALAYAN CHEVROTAIN/
 CINCINNAT 2. 0. 0(2) SINGAPORE 4. 0. 7(0)

Total held: 6.0.7 Number of institutions: 2 Captive Born:100% Wild Born: 0% Captive births last 12 months: 2
 Family Total held: 35.37.16 Captive Born: 97% Wild Born: 3% Captive births last 12 months: 13

Family - Cervidae/DEER/

Moschus moschiferus (no subsp)/MUSK DEER/
 AGRATE 1. 1. 0(0) LEIPZIG 1. 0. 0(1) KUFRI 7. 3. 0(0)

Total held: 9.4.0 Number of institutions: 3 Captive Born: 85% Wild Born: 15% Captive births last 12 months: 1
Moschus moschiferus moschiferus/MUSK DEER/
 SANDIEGOZ 1. 0. 0(0)

Total held: 1.0.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0
Elaphodus cephalopus cephalopus/TUFTED DEER/
 SANDIEGOZ 3. 6. 0(2)

Total held: 3.6.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 2
Elaphodus cephalopus michianus/MICHIES TUFTED DEER/
 NY BRONX 2. 0. 0(1)

Total held: 2.0.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 1
Muntiacus muntjak (no subsp)/INDIAN MUNTJAC/
 ANTWERP 1. 3. 1(1) LOWRY 2. 1. 0(2) MADISON 2. 2. 0(0) MOOREPARK 2. 0. 0(0) PANAMACTY 1. 0. 0(1)

Total held: 8.6.1 Number of institutions: 5 Captive Born: 80% Wild Born: 0% Captive births last 12 months: 4
Muntiacus muntjak vaginalis/INDIAN MUNTJAC/
 CINCINNAT 1. 1. 1(0) METROZOO 2. 3. 0(1) OKLAHOMA 1. 1. 0(0) SANDIEGOZ 7. 8. 0(3) SD-WAP 4. 4. 0(2)

Total held: 15.17.1 Number of institutions: 5 Captive Born: 94% Wild Born: 0% Captive births last 12 months: 6

Muntiacus reevesi (no subsp)/REEVES' MUNTJAC/

BRISTOL	0.	3.	0(0)	CLERES	1.	0.	0(0)	EDINBURGH	2.	3.	0(1)	MAGDEBURG	2.	3.	0(2)	MARWELL	1.	2.	0(0)	MUNICH	1.	0.	0(0)
PENSCYROR	2.	3.	0(0)	SAARBRUCK	2.	2.	2(0)	WHIPSNAD	7.	5.	6(0)	ALEXANDRI	4.	2.	0(1)	ATLANTA	1.	2.	0(1)	AUDUBON	0.	3.	0(0)
BATONROUG	4.	4.	0(4)	BIRMINGHM	1.	3.	0(1)	BISHARCK	3.	9.	0(3)	CALGARY	1.	0.	0(0)	CAPE MAY	1.	1.	0(0)	CHICAGO	2.	2.	0(1)
CINCINNAT	0.	1.	0(0)	CLEVELAND	2.	3.	0(2)	COLUMBUS	1.	1.	0(0)	CYPRESS	2.	2.	0(0)	DENVER	0.	1.	0(0)	EMPORIA	2.	1.	0(0)
GAINSVILLE	1.	3.	0(1)	GARDENCTY	2.	3.	1(1)	GRANDISLE	3.	0.	0(0)	GREENVISC	1.	1.	0(0)	GULF BREZ	4.	7.	0(3)	HOUSTON	2.	4.	3(2)
INDIANAPL	2.	1.	0(1)	LAKBUENA	1.	1.	0(1)	LITTLEROC	1.	3.	0(1)	LODI	3.	2.	0(1)	LOUISVILL	1.	1.	1(2)	LOWRY	2.	1.	1(1)
MANHATTAN	0.	1.	0(0)	MEMPHIS	2.	1.	0(2)	MONROE	4.	1.	3(3)	MONTGOMRY	2.	4.	0(2)	MOOREPARK	0.	1.	0(0)	NICHOLS	1.	2.	0(0)
WORFOLK	1.	1.	0(0)	NY BRONX	2.	2.	0(1)	NYP-CRC	1.	1.	0(0)	NYP-WASH	5.	2.	0(1)	OMAHA	3.	3.	1(2)	PANAMACTY	1.	1.	0(2)
PHOENIX	1.	2.	0(1)	PITTSBURG	1.	2.	1(2)	RACINE	1.	1.	0(0)	ROCHESTER	1.	2.	0(2)	SAN ANTON	2.	4.	1(1)	SAN JOSEBZ	2.	1.	0(1)
SCOTTISBLU	2.	2.	0(0)	SEATTLE	2.	2.	0(1)	SEDGWICK	2.	2.	0(1)	THREE BAR	1.	1.	0(0)	TOPEKA	2.	1.	0(1)	TORONTO	11.	8.	0(3)
W PALM BE	1.	1.	0(0)	WILD WRLD	3.	6.	0(2)																

Total held: 119.138.20 Number of institutions: 62 Captive Born: 96% Wild Born: 0% Captive births last 12 months: 58

Muntiacus reevesi reevesi/REEVES' MUNTJAC/

AUGSBURG	1.	1.	0(0)	AUDUBON	1.	0.	0(0)	BATONROUG	0.	1.	0(0)	FRESNO	0.	0.	1(0)	JACKSON	3.	4.	0(2)	MINNESOTA	1.	0.	0(0)
OMAHA	0.	1.	0(0)	SD-WAP	5.	7.	0(1)																

Total held: 11.14.1 Number of institutions: 8 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 3

Muntiacus reevesi micrurus/REEVES' MUNTJAC/

SANDIEGOZ	3.	1.	0(0)	SD-WAP	6.	7.	1(2)															
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Total held: 9.8.1 Number of institutions: 2 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 2

Cervus albirostris/THOROLD'S DEER/IUCN Red List: Indeterminate Status in wild

ROTTERDAM	1.	1.	0(2)	CLEVELAND	2.	0.	0(0)	SANDIEGOZ	1.	5.	0(0)											
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Total held: 4.6.0 Number of institutions: 3 Captive Born: 70% Wild Born: 0% Captive births last 12 months: 2

Cervus axis (no subsp)/AXIS DEER/

BARCELONA	2.	7.	0(2)	CHESTER	3.	11.	0(5)	COLCHESTR	0.	2.	0(0)	DUISBURG	2.	6.	4(5)	GLASGOW	0.	0.	4(0)	KOBENHAVN	2.	6.	0(3)
MARWELL	4.	5.	1(4)	WHIPSNAD	2.	2.	4(8)	PRETORIA	5.	7.	0(3)	BALTIMORE	4.	5.	2(2)	BATONROUG	0.	1.	0(1)	BUFFALO	5.	18.	0(4)
COLUMBUS	1.	2.	0(0)	DALLAS	1.	2.	0(0)	DOSMELL	2.	2.	0(0)	EVANSVILLE	1.	0.	0(0)	FORTWORTH	0.	2.	0(2)	GULF BREZ	1.	6.	3(0)
MONTGOMRY	3.	4.	0(3)	NY BRONX	18.	24.	2(3)	SAN FRAN	1.	0.	0(0)	THREE BAR	1.	0.	0(0)	WILD WRLD	1.	4.	7(3)	SINGAPORE	2.	0.	3(0)
TALLIN	4.	10.	0(0)	MELBOURNE	4.	6.	0(4)	PEARL CST	1.	0.	0(0)												

Total held: 70.132.30 Number of institutions: 27 Captive Born: 98% Wild Born: 0% Captive births last 12 months: 52

Cervus axis axis/AXIS DEER/

AALBORG	2.	4.	1(2)	AMSTERDAM	1.	1.	0(0)	FOTA	12.	20.	6(7)	MAGDEBURG	4.	9.	0(3)	MUNICH	1.	4.	0(0)	PARIS ZOO	2.	11.	1(4)
WHIPSNAD	4.	2.	2(4)	AUDUBON	1.	4.	0(0)	BATONROUG	2.	0.	0(2)	METROZOO	1.	3.	0(0)	SANDIEGOZ	1.	2.	0(1)	SD-WAP	11.	26.	1(5)
SEATTLE	0.	2.	0(0)	DUBBO	0.	2.	0(1)	WERRIBEE	8.	2.	0(1)												

Total held: 50.92.11 Number of institutions: 15 Captive Born: 98% Wild Born: 0% Captive births last 12 months: 30

Cervus dama/FALLOW DEER/

ANTWERP	1.	9.	0(0)	BARCELONA	2.	8.	0(0)	COLWYNBAY	7.	8.	2(0)	HELSENKI	3.	5.	1(3)	RHENEN	2.	3.	0(0)	ROTTERDAM	2.	3.	0(2)
WHIPSNAD	8.	2.	1(4)	BISMARCK	4.	6.	0(2)	BRIDGETON	5.	6.	0(0)	CHIEHAW	5.	5.	0(1)	COAL VAL	1.	1.	1(0)	DULUTH	0.	1.	0(0)
ERIE	1.	4.	0(0)	GRANBY	2.	5.	0(0)	GRANDISLE	1.	1.	0(0)	GULF BREZ	1.	2.	0(0)	KNOXLAND	0.	2.	2(0)	KNOXVILLE	1.	0.	0(0)
MINOT	0.	2.	1(0)	PANAMACTY	2.	2.	0(2)	QUEBEC	3.	3.	0(0)	RACINE	1.	2.	0(1)	ROCHESTER	1.	3.	0(0)	SAN FRAN	0.	1.	0(0)
SCOVILL F	1.	1.	1(0)	SD-WAP	5.	6.	0(1)	SOUTHBEND	2.	6.	0(1)	ST FELICI	18.	22.	0(4)	STATEN IS	0.	5.	0(0)	TAUTPAUS	1.	0.	0(0)
UTICA	2.	3.	0(1)	W ORANGE	1.	0.	0(0)	WINSTON	8.	11.	0(1)	GUADALJR	3.	5.	0(0)	TALLIN	5.	10.	0(0)	DUBBO	2.	1.	0(2)
HAMILTON	5.	27.	0(0)	WERRIBEE	2.	18.	1(9)																

Total held: 108.202.19 Number of institutions: 38 Captive Born: 95% Wild Born: 0% Captive births last 12 months: 34

Cervus elaphus manitobensis/CANADIAN ELK/

CALGARY 2. 3. 1(1)

Total held: 2.3.1 Number of institutions: 1 Captive Born: 33% Wild Born: 50% Captive births last 12 months: 1

Cervus elaphus nannodes/TULE ELK/

AUDUBON 1. 2. 0(0) FRESNO 1. 2. 0(0) KNOWLAND 4. 10. 0(1) SD-WAP 2. 0. 0(0)

Total held: 8.14.0 Number of institutions: 4 Captive Born: 95% Wild Born: 0% Captive births last 12 months: 1

Cervus elaphus nelsoni/NELSON'S ELK/

LINCOLN M 2. 6. 0(0) MCLEAN 2. 6. 0(0) MINOT 0. 2. 0(0) PIONEERS 1. 7. 0(0)

Total held: 5.21.0 Number of institutions: 4 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 0

Cervus elaphus nelsoni <<< Hybrid >>> /NELSON'S ELK/

MINOT 2. 6. 0(1)

Total held: 2.0.0 Number of institutions: 1 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 1

Cervus elaphus roosevelti/ROOSEVELT ELK/

EUREKA 1. 0. 0(0) NW TREK 13. 19. 4(8) PROVIDENCE 2. 3. 0(2) SEATTLE 1. 4. 0(1) SYRACUSE 2. 3. 0(2) WINSTON 4. 9. 0(2)

Total held: 23.38.4 Number of institutions: 6 Captive Born: 92% Wild Born: 8% Captive births last 12 months: 15

Cervus elaphus scoticus/RED DEER/

QUEBEC 1. 2. 0(0) SD-WAP 7. 6. 0(0)

Total held: 8.8.0 Number of institutions: 2 Captive Born: 75% Wild Born: 0% Captive births last 12 months: 0

Cervus elaphus sibiricus/RED DEER/

SANDIEGOZ 2. 2. 0(0) SD-WAP 3. 4. 1(0)

Total held: 5.6.1 Number of institutions: 2 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 0

Cervus eldi (no subsp)/ELD'S DEER/

MONTGOMRY 1. 3. 0(0) NY BRONX 1. 0. 0(0) MYSORE 2. 9. 1(0)

Total held: 4.12.1 Number of institutions: 3 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 0

Cervus eldi eldi/MANIPUR BROW-ANTLERED DEER/IUCN Red List: Endangered in wild

KANPUR 4. 6. 0(0)

Total held: 4.6.0 Number of institutions: 1 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 0

Cervus eldi siamensis/THAILAND BROW-ANTLERED DEER/IUCN Red List: Endangered in wild

PARIS ZOO 3. 6. 0(1)

Total held: 3.6.0 Number of institutions: 1 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 1

Cervus eldi thamin/BURMESE BROW-ANTLERED DEER/

MAGDEBURG 1. 2. 0(0) PRAHA 2. 6. 0(1) ROTTERDAM 1. 1. 0(0) ZURICH 2. 5. 0(2) BATHORCUG 0. 4. 0(0) NY BRONX 22. 20. 1(0)

NZP-CRC 20. 20. 0(0) NZP-WASH 1. 4. 0(0) SANDIEGOZ 1. 0. 0(0) SD-WAP 11. 20. 0(7) ST LOUIS 1. 2. 0(0) SINGAPORE 6. 3. 0(9)

Total held: 68.87.1 Number of institutions: 12 Captive Born: 99% Wild Born: 0% Captive births last 12 months: 19

IBIS Abstract Report

30 Jun 1992

Cervus mesopotamicus/PERSIAN FALLOW DEER/

BORAS 13. 7. 1(5) MUNTICH 2. 3. 0(0) SANDIEGOZ 1. 0. 0(0) TAUTPHAUS 1. 0. 0(0)

Total held: 17.10.1 Number of institutions: 4 Captive Born:100% Wild Born: 0% Captive births last 12 months: 5

Cervus nippon (no subsp)/SIKA DEER/

WHIPSADE 9. 25. 6(6) AYOITE 2. 0(1) CHEHAW 2. 9. 1(0) COAL VAL 1. 3. 2(1) ERIE 0. 4. 0(0)
 INDEPENDC 1. 1. 7(0) KNOWLAND 3. 8. 0(0) LITTLEROC 1. 2. 1(1) MINOT 1. 4. 0(0) MOOREPARK 1. 0. 0(0)
 ST FELICI 7. 8. 0(1) TAUTPHAUS 2. 5. 0(1) WINSTON 7. 10. 2(3) GUADALJR 1. 2. 0(0) TALLIN 3. 2. 0(0)

Total held: 43.93.19 Number of institutions: 18 Captive Born: 97% Wild Born: 0% Captive births last 12 months: 14

Cervus nippon nippon/SIKA DEER/

BIRMINGHM 1. 0. 0(0) PUEBLO 2. 3. 0(2)

Total held: 3.3.0 Number of institutions: 2 Captive Born: 83% Wild Born: 0% Captive births last 12 months: 2

Cervus nippon dybowskii/SIKA DEER/

MUPPERTAL 3. 8. 0(4) PRETORIA 1. 1. 0(0) GLEN OAK 2. 1. 0(0) SD-WAP 5. 8. 0(1)

Total held: 11.18.0 Number of institutions: 4 Captive Born: 93% Wild Born: 3% Captive births last 12 months: 5

Cervus nippon mandarinus/SIKA DEER/

SANDIEGOZ 3. 3. 0(0)

Total held: 3.3.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0

Cervus nippon mantschuricus/SIKA DEER/

TORONTO 0. 2. 0(0)

Total held: 0.2.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0

Cervus nippon pseudaxis/SIKA DEER/

MULHOUSE 8. 11. 0(3) OKLAHOMA 1. 2. 0(0) SANDIEGOZ 6. 8. 0(1) SD-WAP 5. 3. 0(0)

Total held: 20.24.0 Number of institutions: 4 Captive Born:100% Wild Born: 0% Captive births last 12 months: 4

Cervus nippon taiwanus/SIKA DEER/

PAIGHTON 1. 8. 0(0) BATTLE CR 3. 3. 0(2) BRIDGEPT 1. 2. 0(0) FRANKLINP 2. 8. 0(0) NY BRONX 10. 31. 0(5) SD-WAP 9. 19. 0(0)

Total held: 26.69.0 Number of institutions: 6 Captive Born:100% Wild Born: 0% Captive births last 12 months: 7

Cervus porcinus (no subsp)/HOG DEER/

AMSTERDAH 4. 3. 0(2) COLCHESTR 0. 1. 0(0) LONDON RP 0. 1. 0(0) MARMELL 7. 10. 0(4) WHIPSADE 5. 5. 4(8)
 AUDUBON 1. 0. 0(0) MEMPHIS 2. 5. 0(3) OKLAHOMA 2. 4. 0(2)

Total held: 24.34.4 Number of institutions: 9 Captive Born:100% Wild Born: 0% Captive births last 12 months: 20

Cervus porcinus porcinus/HOG DEER/

SD-WAP 7. 12. 0(3)

Total held: 7.12.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 3

Cervus porcinus calamanensis/CALAMIAN DEER/

WHIPSADE 2. 0. 0(0)

Total held: 2.0.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0

GAINSVILLE 1. 3. 0(0)
 SEDGWICK 0. 1. 0(0)
 HAMILTON 1. 4. 0(0)

PRETORIA 3. 5. 0(1)

Cervus porcinus kuhlii/BAWEAN DEER/
SANDIEGOZ 1. 5. 0(0) SINGAPORE 1. 2. 0(1)

Total held: 2.7.0 Number of institutions: 2 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 1

Cervus timorensis (no subsp)/TIMOR DEER/
HAMILTON 2. 6. 0(0) WINNELLIE 5. 3. 0(1)

Total held: 7.9.0 Number of institutions: 2 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 1

Cervus timorensis russa/JAVAN RUSA/
SD-WAP 2. 10. 0(1)

Total held: 2.10.0 Number of institutions: 1 Captive Born: 92% Wild Born: 0% Captive births last 12 months: 1

Cervus unicolor (no subsp)/SAMBAR/
BARCELONA 2. 2. 0(0) NY BRONX 11. 14. 0(1) DUBBO 3. 13. 0(0) WERRIBEE 10. 14. 2(3)

Total held: 33.51.2 Number of institutions: 6 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 9

Cervus unicolor malaccensis/SAMBAR/
SD-WAP 6. 14. 0(6) SINGAPORE 0. 0. 1(1)

Total held: 6.14.1 Number of institutions: 2 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 7

Cervus unicolor niger/SAMBAR/
SD-WAP 8. 11. 0(2)

Total held: 8.11.0 Number of institutions: 1 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 2

Cervus alfredi/PRIMER ALFRED'S SPOTTED DEER/
MULHOUSE 4. 4. 0(2)

Total held: 4.4.0 Number of institutions: 1 Captive Born: 38% Wild Born: 63% Captive births last 12 months: 2

Elaphurus davidianus/PERE DAVID'S DEER/

AMSTERDAM 15. 16. 14(1) BARCELONA 3. 8. 0(1) CHESTER 3. 9. 0(2) DE CAMPO 3. 0. 0(1) DUISBURG 2. 8. 1(1) EDINBURGH 1. 2. 0(0) EDINBURGH 1. 2. 0(0)
GLASGOW 0. 0. 2(0) HANNOVER 2. 3. 1(0) MAGDEBURG 0. 1. 0(0) PRAHA 4. 11. 0(2) ROTTERDAM 1. 3. 3(1) SAARBRUCK 1. 3. 1(0)
WHIPPSNADE 15. 38. 11(10) WAPPERTAL 1. 7. 0(2) CHICAGOBR 1. 3. 0(0) CHICAGOLP 0. 1. 0(0) DENVER 1. 5. 0(0) DETROIT 3. 6. 0(3)
LOUISVILL 1. 2. 0(0) MADISON 1. 3. 0(0) MCCOMBS 2. 3. 0(1) MCLEAN 4. 4. 0(0) MEMPHIS 2. 6. 0(0) MONROE 1. 2. 0(0)
NY BRONX 9. 21. 0(1) NZP-CRC 45. 54. 2(20) OKLAHOMA 1. 1. 0(0) SANDIEGOZ 1. 1. 0(0) SD-WAP 3. 2. 0(0) TALLIN 9. 6. 0(0) MOSCOW 1. 3. 0(0)

Total held: 136.232.35 Number of institutions: 31 Captive Born: 99% Wild Born: 0% Captive births last 12 months: 48

Alces alces (no subsp)/MOOSE/
AMSTERDAM 1. 1. 1(0) CALGARY 2. 2. 0(0) MINNESOTA 1. 3. 0(2)

Total held: 11.9.1 Number of institutions: 4 Captive Born: 67% Wild Born: 33% Captive births last 12 months: 2

Alces alces (no subsp)/ <<< Hybrid >>> /MOOSE/
MILWAUKEE 10. 1. 3(0)

Total held: 10.1.3 Number of institutions: 1 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 0

Alces alces alces/EUROPEAN ELK/
AMSTERDAM 1. 0. 0(0) BORAS 2. 1. 0(0) DE CAMPO 1. 1. 0(0) HELSINKI 1. 4. 0(0) KREFELD 1. 3. 0(0) MUNCH 1. 3. 0(0)

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Total held: 9.13.0      Number of institutions: 7  Captive Born: 77%  Wild Born: 23%  Captive births last 12 months: 0
Alces alces americana/MOOSE/
GRANBY 1. 0. 0(0)  MILWAUKEE 1. 0. 0(0)  QUEBEC 1. 1. 0(0)  ST FELICI 1. 1. 0(0)  ST JOHNS 1. 1. 0(0)  TORONTO/ 2. 0. 0(0)
Total held: 7.3.0      Number of institutions: 6  Captive Born: 20%  Wild Born: 80%  Captive births last 12 months: 0
Alces alces andersoni/MOOSE/
MINNESOTA 1. 0. 0(0)  NW TREK 2. 2. 0(0)  VALLEYZOO 2. 0. 1(0)
Total held: 5.2.1      Number of institutions: 3  Captive Born: 38%  Wild Born: 63%  Captive births last 12 months: 0
Alces alces gigas/ALASKAN MOOSE/
COLUMBUS 2. 2. 0(0)  MINNESOTA 1. 0. 0(0)
Total held: 3.2.0      Number of institutions: 2  Captive Born: 0%  Wild Born: 100%  Captive births last 12 months: 0
Blastoceros campetris (no subsp)/PAMPAS DEER/
SANDIEGOZ 0. 1. 0(0)
Total held: 0.1.0      Number of institutions: 1  Captive Born: 100%  Wild Born: 0%  Captive births last 12 months: 0
Blastoceros campestris bucogaster/PAMPAS DEER/
SANDIEGOZ 3. 6. 1(0)  SD-WAP 1. 1. 0(0)
Total held: 4.7.1      Number of institutions: 2  Captive Born: 100%  Wild Born: 0%  Captive births last 12 months: 0
Blastocerus dichotomus/SWAMP DEER/IUCN Red List: Vulnerable in wild
KREFELD 1. 1. 0(0)
Total held: 1.1.0      Number of institutions: 1  Captive Born: 100%  Wild Born: 0%  Captive births last 12 months: 0
Capreolus capreolus (no subsp)/ROE DEER/
AMSTERDAM 1. 2. 0(0)
Total held: 1.2.0      Number of institutions: 1  Captive Born: 67%  Wild Born: 0%  Captive births last 12 months: 0
Capreolus capreolus capreolus/ROE DEER/
LA PLAINE 0. 1. 0(0)  LEIPZIG 1. 1. 0(2)  LODZ 2. 4. 0(0)  WARSAW 1. 2. 0(0)  SANDIEGOZ 5. 3. 0(0)
Total held: 12.12.0      Number of institutions: 6  Captive Born: 42%  Wild Born: 58%  Captive births last 12 months: 2
Hydropotes inermis (no subsp)/CHINESE WATER DEER/
CHESTER 1. 0. 0(0)  LOSANGELE 2. 3. 0(3)  LOUISVILL 1. 2. 0(0)  MEMPHIS 1. 0. 0(0)  NELSONS 7. 3. 0(3)  TALLIN 1. 3. 0(0)
Total held: 14.16.0      Number of institutions: 7  Captive Born: 93%  Wild Born: 0%  Captive births last 12 months: 9
Hydropotes inermis inermis/CHINESE WATER DEER/
SANDIEGOZ 3. 10. 0(0)  SD-WAP 3. 3. 0(0)
Total held: 6.13.0      Number of institutions: 2  Captive Born: 100%  Wild Born: 0%  Captive births last 12 months: 0
Mazama americana (no subsp)/RED BROCKET/
COLUMBUS 1. 1. 0(0)  EL PASO 1. 0. 0(0)  NELSONS 1. 1. 0(0)  NY BRONX 3. 2. 0(1)  PARAMUS 1. 1. 0(0)  SAN ANTON 1. 1. 0(0)
Total held: 8.6.0      Number of institutions: 6  Captive Born: 100%  Wild Born: 0%  Captive births last 12 months: 1
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Mazama americana temama/RED BROCKET/

BROWNSVIL 1. 1. 0(0) LITTLEROC 1. 3. 0(0) SANDIEGOZ 1. 2. 0(1) SD-WAP 1. 1. 0(1)

Total held: 4.7.0 Number of institutions: 4 Captive Born:100% Wild Born: 0% Captive births last 12 months: 2

Mazama americana zella/RED BROCKET/

MEDELLIN 1. 0. 0(0)

Total held: 1.0.0 Number of institutions: 1 Captive Born: 0% Wild Born:100% Captive births last 12 months: 0

Mazama gouazoubira (no subsp)/BROWN BROCKET/

KREFELD 2. 1. 0(0)

Total held: 2.1.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0

Odocoileus hemionus (no subsp)/MULE DEER/DENVER 1. 0. 0(0) MILWAUKEE 1. 2. 0(0) MOOREPARK 0. 1. 0(0) ROSS PK 3. 1. 0(0) SAN FRAN 0. 4. 0(0)
SOUTH NEV 1. 0. 0(0) WINSTON 1. 0. 0(0)

SIOUX FAL 1. 3. 0(2)

Total held: 8.11.0 Number of institutions: 8 Captive Born: 32% Wild Born: 47% Captive births last 12 months: 2

Odocoileus hemionus hemionus/MULE DEER/

BISMARCK 1. 4. 0(0) CALGARY 1. 2. 2(2) EMPORIA 2. 2. 0(0) SCOTTSBLU 2. 0. 0(0) WATERTSD 2. 3. 0(0)

Total held: 8.11.2 Number of institutions: 5 Captive Born: 62% Wild Born: 38% Captive births last 12 months: 2

Odocoileus hemionus columbiana/MULE DEER/

TORONTO 3. 0. 0(0) VANCOUVER 2. 2. 0(0)

Total held: 5.2.0 Number of institutions: 2 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0

Odocoileus hemionus crooki/MULE DEER/

ASDM TUSC 0. 1. 0(0)

Total held: 0.1.0 Number of institutions: 1 Captive Born: 0% Wild Born:100% Captive births last 12 months: 0

Odocoileus virginianus (no subsp)/WHITETAILED DEER/DE CAMPO 0. 2. 0(0) DUISBURG 1. 4. 0(0) AUDUBON 0. 2. 0(0) BRIDGEPRT 0. 2. 0(0) BROWNSVIL 2. 3. 0(2)
CAPE MAY 1. 0. 0(0) CHATTANOG 1. 2. 0(0) CHICAGOLP 1. 3. 0(0) CYPRESS 0. 5. 0(0) DULUTH 1. 2. 0(0)
GREEN MSC 1. 2. 0(0) GULF BREZ 1. 3. 0(0) LANING 0. 3. 0(0) LOWRY 1. 4. 1(1) MONT AQ 0. 1. 0(0)
MONTGOMRY 2. 5. 0(0)
MORFOLK 0. 2. 0(0) ROSS PK 5. 4. 0(0) SCOVILL F 2. 6. 0(0) SIOUX FAL 3. 3. 0(1) SYRACUSE 1. 7. 0(0)
VICTOR TX 0. 5. 0(0) W ORANGE 2. 6. 0(0) WHEELING 0. 7. 0(0) CALI 3. 2. 0(0) MEDELLIN 1. 1. 0(0)
WERRIBEE 0. 2. 0(0)CALGARY 2. 1. 0(0)
GRANDISLE 1. 2. 0(0)
MONTGOMRY 2. 5. 0(0)
TULSA 1. 2. 0(0)
DUBBO 0. 2. 0(0)

Total held: 33.95.1 Number of institutions: 31 Captive Born: 45% Wild Born: 47% Captive births last 12 months: 4

Odocoileus virginianus virginiana/WHITETAILED DEER/BIRNINGHM 0. 1. 0(0) BRIDGETON 2. 3. 0(0) CAPE MAY 6. 6. 0(4) DREHER PA 1. 4. 0(1) EMPORIA 0. 1. 0(0)
GRANDISLE 2. 3. 0(0) GRASSHORE 1. 4. 0(0) HANNACITY 16. 19. 32(0) LINCOLM M 3. 6. 2(0) MANHATTAN 0. 1. 0(0)
PIONEERS 0. 3. 0(0) PITTSBURG 4. 2. 0(0) ST FELICI 10. 10. 0(0)GRANBY 4. 8. 1(7)
WZP-WASH 1. 1. 0(0)

Total held: 50.72.35 Number of institutions: 15 Captive Born: 34% Wild Born: 63% Captive births last 12 months: 12

Odocoileus virginianus acapulcensis/WHITETAILED DEER/

TAIPEI 0. 1. 0(0)

Total held: 0.1.0 Number of institutions: 1 Captive Born: 0% Wild Born: 0% Captive births last 12 months: 0

Odocoileus virginianus borealis/WHITETAILED DEER/

HELINSKI 2. 5. 0(3) AKRON 2. 1. 0(0) CINCINNAT 3. 4. 0(0) HERSHEY 1. 1. 0(0) MONT AQ 1. 1. 0(0)
 SANDIEGOZ 0. 2. 0(0) STATEN IS 0. 1. 0(0) SYRACUSE 3. 6. 0(7) TORONTO 11. 14. 2(2)

QUEBEC 2. 4. 0(2)

Total held: 25.39.2 Number of institutions: 10 Captive Born: 89% Wild Born: 11% Captive births last 12 months: 14

Odocoileus virginianus chiriquensis/WHITETAIL DEER/

SANDIEGOZ 1. 0. 0(0)

Total held: 1.0.0 Number of institutions: 1 Captive Born: 0% Wild Born: 0% Captive births last 12 months: 0

Odocoileus virginianus couesi/WHITETAILED DEER/

ASDM TUSC 1. 2. 0(0)

Total held: 1.2.0 Number of institutions: 1 Captive Born: 0% Wild Born: 100% Captive births last 12 months: 0

Odocoileus virginianus dacotensis/WHITETAILED DEER/

BISMARCK 3. 8. 0(2) MINOT 1. 0. 0(0)

Total held: 4.8.0 Number of institutions: 2 Captive Born: 33% Wild Born: 67% Captive births last 12 months: 2

Odocoileus virginianus leucura/WHITETAIL DEER/

WINSTON 0. 2. 0(0)

Total held: 0.2.0 Number of institutions: 1 Captive Born: 100% Wild Born: 0% Captive births last 12 months: 0

Odocoileus virginianus macroura/WHITETAILED DEER/

EMPORIA 2. 1. 0(0) HUTCHINSN 1. 1. 0(0) INDEPENDC 2. 2. 2(0) MANHATTAN 0. 1. 0(0)

Total held: 5.5.2 Number of institutions: 4 Captive Born: 33% Wild Born: 67% Captive births last 12 months: 0

Odocoileus virginianus seminola/WHITETAIL DEER/

JACKSONVL 0. 3. 0(0)

Total held: 0.3.0 Number of institutions: 1 Captive Born: 33% Wild Born: 67% Captive births last 12 months: 0

Odocoileus virginianus sinaloae/WHITETAIL DEER/

GUADALJR 6. 13. 0(8)

Total held: 6.13.0 Number of institutions: 1 Captive Born: 84% Wild Born: 0% Captive births last 12 months: 8

Odocoileus virginianus texana/WHITETAILED DEER/

CALDWELL 0. 11. 0(0) FORTWORTH 1. 4. 0(0) LUFKIN 2. 2. 0(0) WACO 2. 1. 0(0)

Total held: 5.18.0 Number of institutions: 4 Captive Born: 65% Wild Born: 35% Captive births last 12 months: 0

Odocoileus virginianus truei/WHITETAILED DEER/

AUDUBON 0. 1. 0(0)

Total held: 0.1.0 Number of institutions: 1 Captive Born: 0% Wild Born: 100% Captive births last 12 months: 0

Pudu pudu/PUDU/

AMSTERDAM 2. 4. 0(0)
 EDINBURGH 3. 4. 0(0)
 PRETORIA 1. 1. 0(0)
 SD-VAP 1. 1. 0(0)

ANTWERP 1. 0. 0(0) APELDOORN 2. 0. 0(0) BANHAM 1. 1. 0(0) BRISTOL 2. 0. 0(0)
 KOLM 5. 5. 0(2) LONDON RP 1. 0. 1(1) MARWELL 2. 2. 0(1) ROTTERDAM 5. 5. 0(2)
 CINCINNAT 1. 1. 0(0) LOSANGELE 1. 1. 0(0) NY BRONX 7. 8. 0(4) NZP-CRC 1. 1. 1(0)

CHESTER 1. 0. 0(0)
 LUPPERTAL 12. 17. 0(7)
 SANDIEGOZ 3. 2. 0(1)

Total held: 52.53.2

Number of institutions: 19 Captive Born: 97% Wild Born: 2% Captive births last 12 months: 18

Rangifer tarandus (no subsp)/REINDEER/

AMSTERDAM	7.	14.	0(0)	ANTWERP	4.	14.	0(0)	ARNHEM	3.	5.	0(2)	CHESTER	2.	12.	0(1)	DE CAMPO	3.	7.	0(0)	DUDLEY	0.	2.	0(0)	
DUISBURG	2.	5.	0(0)	FRANKFURT	1.	4.	0(0)	KOBENHAVN	3.	7.	0(3)	LEIPZIG	0.	4.	0(4)	LONDON RP	0.	2.	0(0)	MARWELL	0.	2.	0(0)	
MUNSTER	1.	2.	0(0)	PAIGHTON	0.	2.	0(0)	ROTTERDAM	2.	4.	0(3)	WHIPSNADE	2.	5.	0(3)	WUPPERTAL	1.	5.	0(0)	BUFFALO	3.	11.	0(4)	
CHICAGOBR	1.	1.	0(0)	CHICAGOLP	2.	2.	0(1)	CLEVELAND	2.	5.	0(2)	COLUMBUS	2.	5.	0(2)	DENVER	1.	11.	0(3)	DETROIT	2.	4.	0(2)	
INDIANAPL	2.	0.	0(0)	MILWAUKEE	1.	4.	0(0)	MINNESOTA	1.	2.	0(0)	PITTSBURG	1.	3.	0(1)	ROCHESTER	1.	3.	0(1)	SOUTHBEND	1.	3.	0(1)	
SYRACUSE	5.	8.	0(3)	TORONTO	2.	4.	0(0)	VALLEYZOO	1.	0.	0(0)	TALLIN	1.	3.	0(0)									

Total held: 60.165.0 Number of institutions: 34 Captive Born: 93% Wild Born: 1% Captive births last 12 months: 36

Rangifer tarandus tarandus/EURASIAN TUNDRA REINDEER/

ODENSE	1.	1.	0(0)	TORONTO	1.	3.	0(3)
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Total held: 2.4.0 Number of institutions: 2 Captive Born:100% Wild Born: 0% Captive births last 12 months: 3

Rangifer tarandus caribou/AMERICAN WOODLAND CARIBOU/

BOWMANVIL	0.	1.	0(0)	CALGARY	2.	3.	1(0)	GRANBY	1.	2.	1(1)	MINNESOTA	3.	5.	0(0)	NW TREK	3.	7.	0(1)	QUEBEC	1.	5.	0(0)
ST FELICI	1.	4.	0(0)	ST JOHNS	1.	2.	0(0)	TORONTO	5.	10.	0(1)												

Total held: 17.39.2 Number of institutions: 9 Captive Born: 72% Wild Born: 22% Captive births last 12 months: 3

Rangifer tarandus fennicus/EUROPEAN FOREST REINDEER/

BORAS	2.	0.	0(1)	HELSINKI	2.	4.	2(3)	HUNGSTRND	2.	1.	0(0)
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Total held: 6.5.2 Number of institutions: 3 Captive Born:100% Wild Born: 0% Captive births last 12 months: 4

Rangifer tarandus granti/GRANT'S REINDEER/

POINT DEF	1.	1.	0(0)
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Total held: 1.1.0 Number of institutions: 1 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0

Family Total held: 1495.2574.222 Captive Born: 90% Wild Born: 7% Captive births last 12 months: 595

Family - Giraffidae/GIRAFFES, OKAPIS/

Giraffa camelopardalis (no subsp)/GIRAFFE/

AMSTERDAM	1.	1.	0(0)	BRISTOL	1.	0.	0(0)	BUDAPEST	1.	0.	0(0)	DUBLIN RP	0.	1.	0(0)	EDINBURGH	1.	2.	0(0)	EMMEN	3.	10.	0(2)
FOTA	0.	1.	0(0)	LA PALMYR	0.	5.	0(1)	LODZ	1.	0.	0(0)	LONDON RP	1.	3.	0(0)	MAGDEBURG	0.	1.	0(0)	MARWELL	1.	5.	0(0)
MUNICH	2.	3.	0(0)	ODENSE	0.	1.	0(0)	PAIGHTON	1.	0.	0(0)	PARIS ZOO	2.	3.	0(0)	PRAHA	0.	1.	0(0)	SAARBRUCK	1.	2.	0(0)
WHITPSNADE	1.	0.	0(0)	PRETORIA	1.	2.	0(0)	BROMSVIL	0.	2.	0(0)	HOUSTON	0.	2.	0(1)	JACKSONVL	0.	2.	0(0)	KINGS ISL	1.	3.	0(1)
REDWOOD	1.	1.	0(1)	RIO GRAND	1.	3.	0(0)	RIVERBANK	0.	1.	0(0)	TOPEKA	0.	1.	0(0)	W PALM BE	4.	2.	0(0)	KANPUR	0.	1.	0(0)
ADELAIDE	2.	3.	0(2)	DUBBO	2.	1.	0(0)	MELBOURNE	1.	2.	0(0)	SYDNEY	3.	5.	0(2)	WELLINGTN	1.	1.	0(0)	MERRIBEE	3.	0.	0(0)

Total held: 37.71.0 Number of institutions: 36 Captive Born: 66% Wild Born: 6% Captive births last 12 months: 10

Giraffa camelopardalis (no subsp) / <<< Hybrid >>> /GIRAFFE/

AMSTERDAM	0.	1.	0(0)	BARCELONA	1.	2.	0(0)	BELFAST	1.	1.	0(0)	BORAS	0.	1.	0(0)	CHESTER	1.	2.	0(0)	GIYSKUD	1.	0.	0(0)
KARLSRUHE	0.	2.	0(0)	MAGDEBURG	0.	1.	0(0)	DICKERSON	1.	0.	0(0)	REDWOOD	0.	1.	0(0)	YULEE	0.	1.	0(0)	GUADALJR	0.	2.	0(0)
TOKYUENO	1.	1.	0(0)	AUCKLAND	1.	4.	0(0)	WELLINGTN	1.	0.	0(0)												

Total held: 8.19.0 Number of institutions: 15 Captive Born:100% Wild Born: 0% Captive births last 12 months: 0

Giraffa camelopardalis cameloparda+/NUBIAN GIRAFFE/

HONOLULU	0.	1.	0(1)	HOUSTON	1.	1.	0(0)
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Total held: 1.2.0 Number of institutions: 2 Captive Born:100% Wild Born: 0% Captive births last 12 months: 1

GLOBAL

CAPTIVE ACTION PLAN

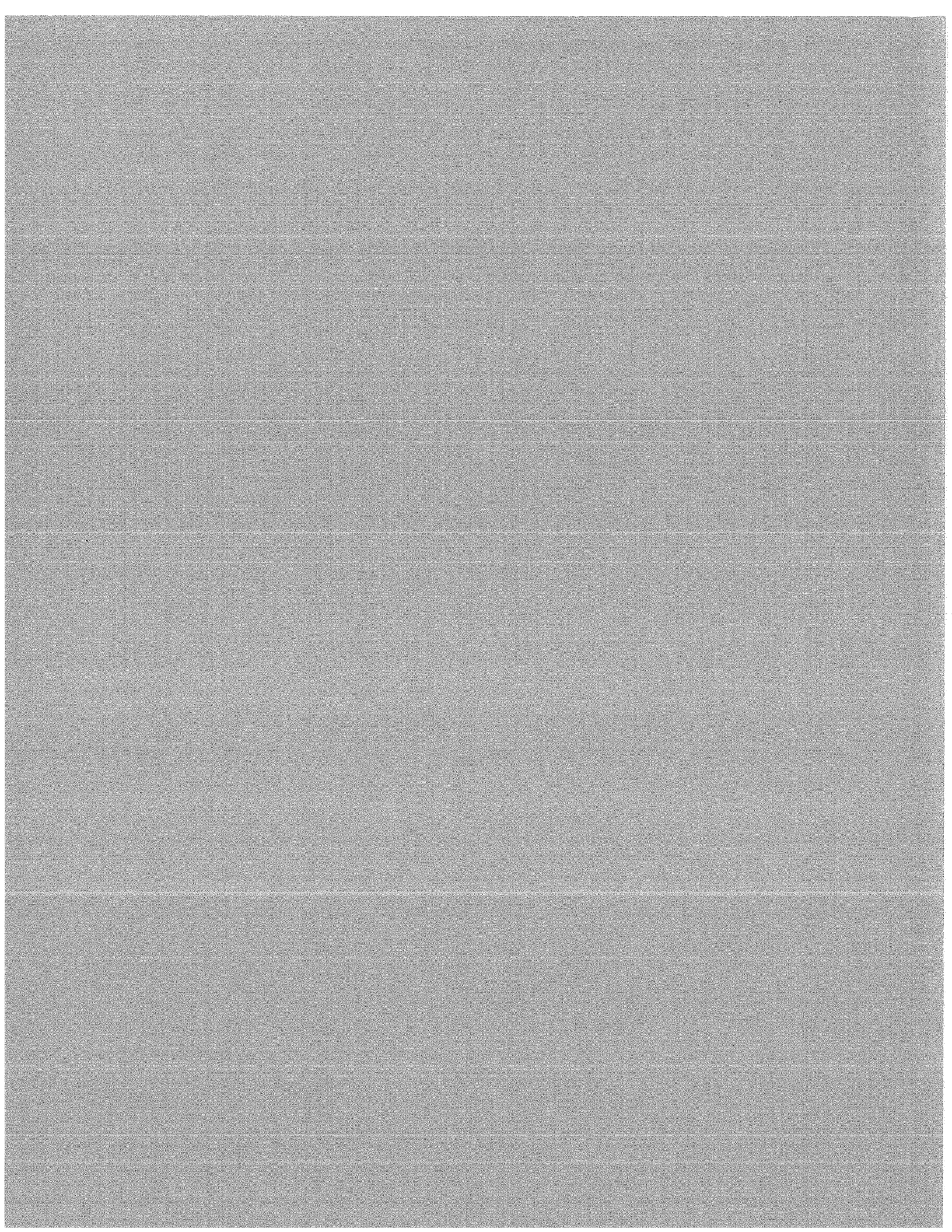
FOR

CERVIDS

San Diego, CA
18 - 20 March 1993

BRIEFING BOOK

SECTION 3
ISIS TAG REPORT



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Taxon          Number of Collections  31/12/1992  Crude Demographics  Crude Genetics
              CensuS      CBR  CIR  CDR  CDRn  CER  CRC  %>=F2  Wcbr  WCliv  WClivbr  LivBr
=====

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=====
Explanatory Notes
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Collection- Number of collections holding living specimens on ISIS as of report date.
? = specimen currently OFF ISIS inventory

Census - Live count on ISIS as of end of year (Male.Female.Unknown).

Crude Demographics> mean of last 5 years annual rates

- CBR - Crude birth rate (births per 100).
- CIR - Crude import rate (imports per 100).
- CDR - Crude death rate (deaths per 100).
- CDRn - Crude death rate of neonates (neonatal deaths per 100 births).
- CER - Crude export rate (exports per 100).
- CRC - Crude rate of change (actual observed annual growth rate).

Crude Genetics>


- %>=F2 - Percent living in second or higher generation of captivity.
- Wcbr - Wild caught breeders.
- WCliv - Wild caught individuals currently alive.
- WClivbr - Wild caught individuals currently alive that are breeders.
- LivBr - Total living breeders of all origins.

The AgeBar is intended to represent a density bar chart of the populations age distribution. A dark square indicates that the bar for that age class should rise to within 80 percent of the chart top. A single dot indicates that the bar is less than or equal to only 20 percent toward the chart top. Other densities lie between.

An example:

(bar chart)

Age Distribution: 0  10 age classes...

Age Distribution: 0  10 age classes... (single line chart)

4 Mar 1993

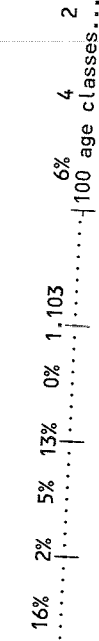
ISIS TAG Report

Page 1

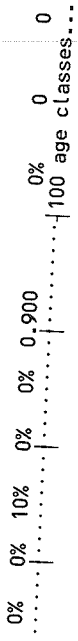
Taxon: Cervidae/DEER/family
 Number of Collections: 31/12/1992
 Crude Demographics: CBR CIR CDR CDRn CER CRC
 Crude Genetics: %>=F2 Wcbr WCliv WClivbr LivBr

Moschus/DEER, MUSK/genus

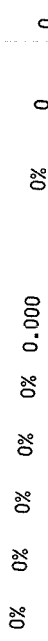
Moschus moschiferus (no subsp)/MUSK DEER/
 Age Distribution: 0 | 11.6.0



Moschus moschiferus moschiferus/MUSK DEER/
 Age Distribution: 0 | 1.0.0

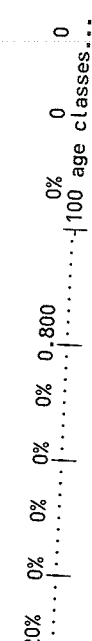


Moschus moschiferus arcticus/MUSK DEER/
 Age Distribution: 0 | 0.0.0

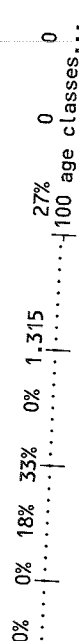


Elaphodus/DEER, TUFTED/genus

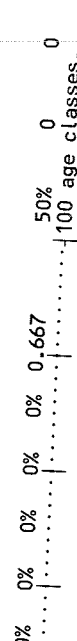
Elaphodus cephalophus/TUFTED DEER/
 Age Distribution: 0 | 1.1.0



Elaphodus cephalophus cephalophus/TUFTED DEER/
 Age Distribution: 0 | 5.6.0

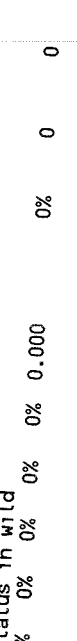


Elaphodus cephalophus michianus/MICHIES TUFTED DEER/
 Age Distribution: 0 | 1.1.0

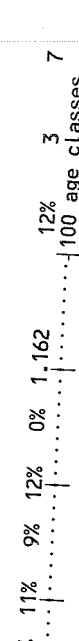


Muntiacus/MUNTJAC/genus

Muntiacus crinifrons/BLACK MUNTJAC/
 Age Distribution: 0 | 0.0.0



Muntiacus muntjak (no subsp)/INDIAN MUNTJAC/
 Age Distribution: 0 | 8.9.0



Age Distribution Percentiles: █ > 80th, █ > 60th, █ > 40th, █ > 20th

Taxon	Number of Collections	31/12/1992 Census	Crude Demographics	Crude Genetics
		CBR CIR CDR CDRn CER CRC	%>F2 WCliv WClivbr LivBr	

Cervus dama / <<< Hybrid >>> / FALLOW DEER /
 ISIS Global: 0 0.0.0 0.0 0% 0% 0% 0% 0% 0.000 0% 0 0 0 0 0

Cervus duvauceli (no subsp) / BARASINGHA / SWAMP DEER / IUCN Red List: Endangered in wild
 ISIS Global: 14 43.63.2 32% 0% 16% 31% 0% 1,007 23% 2 0 0 0 32

Cervus duvauceli duvauceli / BARASINGHA / SWAMP DEER / IUCN Red List: Endangered in wild
 ISIS Global: 6 23.55.6 21% 0% 13% 43% 0% 1,061 14% 0 0 0 0 31

Cervus duvauceli branderi / BARASINGHA / SWAMP DEER / IUCN Red List: Endangered in wild
 ISIS Global: 0 0.0.0 6% 0% 13% 0% 0% 0.564 0% 0 0 0 0 0

Cervus elaphus (no subsp) / RED DEER /
 ISIS Global: 6 34.93.1 43% 1% 9% 13% 0% 1,210 35% 6 2 0 0 42

Cervus elaphus (no subsp) / <<< Hybrid >>> / RED DEER /
 ISIS Global: 5 5.6.0 72% 0% 6% 3% 0% 1,280 0% 0 0 0 0 0

Cervus elaphus bactrianus / BACTRIAN WAPITI / IUCN Red List: Endangered in wild
 ISIS Global: 4 10.14.0 32% 0% 17% 25% 0% 1,103 50% 0 0 0 0 11

Cervus elaphus barbarus / BARBARY STAG /
 ISIS Global: 1 1.3.0 7% 0% 0% 0% 0% 0.667 0% 0 0 0 0 0

Cervus elaphus canadensis / AMERICAN ELK /
 ISIS Global: 43 60.145.4 30% 1% 11% 17% 0% 0.993 33% 59 21 12 102

Cervus elaphus hippelaphus / RED DEER /
 ISIS Global: 6 13.28.4 34% 1% 16% 23% 0% 1,027 13% 4 2 2 17

Cervus elaphus hispanicus / RED DEER /
 ISIS Global: 2 6.19.0 26% 2% 10% 8% 0% 1,066 0% 3 7 3 8

Age Distribution Percentiles: █ > 80th, █ > 60th, █ > 40th, █ > 20th

Taxon	Number of Collections	31/12/1992 Census	Crude Demographics CBR CIR CDR CDRn CER CRC	Crude Genetics %>F2 WCBr WCLivR WCLivBr LivBr
<i>Cervus elaphus macneilli</i> /RED DEER/ ISIS Global: 1	4.3.0	33% 0% 0% 0% 0% 1.330	14% 0 0 2	100 age classes...
Age Distribution: 0				
<i>Cervus elaphus manitobensis</i> /CANADIAN ELK/ ISIS Global: 1	3.2.0	52% 11% 5% 20% 0% 1.039	0% 7 3 3	100 age classes...
Age Distribution: 0				
<i>Cervus elaphus nannodes</i> /TULE ELK/ ISIS Global: 4	6.12.0	11% 0% 5% 0% 0% 1.070	17% 2 1 0 7	100 age classes...
Age Distribution: 0				
<i>Cervus elaphus nelsoni</i> /NELSON'S ELK/ ISIS Global: 7	9.40.0	14% 0% 1% 1% 0% 1.047	6% 4 0 0 15	100 age classes...
Age Distribution: 0				
<i>Cervus elaphus roosevelti</i> /ROOSEVELT ELK/ ISIS Global: 8	22.33.3	32% 3% 10% 16% 0% 0.971	5% 8 5 2 15	100 age classes...
Age Distribution: 0				
<i>Cervus elaphus scoticus</i> /RED DEER/ ISIS Global: 3	6.9.0	52% 0% 5% 8% 0% 1.176	33% 4 2 1 3	100 age classes...
Age Distribution: 0				
<i>Cervus elaphus sibiricus</i> /RED DEER/ ISIS Global: 2	5.8.0	26% 0% 19% 15% 0% 0.918	15% 0 0 0 5	100 age classes...
Age Distribution: 0				
<i>Cervus elaphus xanthopygus</i> /RED DEER/ ISIS Global: 0	0.0.0	0% 0% 0% 0% 0% 0.000	0% 0 0 0 0	100 age classes...
Age Distribution: 0				
<i>Cervus eldi</i> (no subsp)/ELD'S DEER/ ISIS Global: 4	4.11.1	7% 0% 4% 13% 0% 1.004	6% 0 0 0 1	100 age classes...
Age Distribution: 0				
<i>Cervus eldi eldi</i> /MANIPUR BROW-ANTLERED DEER/ ISIS Global: 1	4.5.0	5% 0% 2% 0% 0% 1.030	22% 0 0 0 3	100 age classes...
Age Distribution: 0				
<i>Cervus eldi siamensis</i> /THAILAND BROW-ANTLERED DEER/ ISIS Global: 1	3.6.0	50% 0% 37% 78% 0% 1.134	44% 0 0 0 5	100 age classes...
Age Distribution: 0				

Taxon	Number of Collections	31/12/1992 Census	Crude Demographics	CRC	CER	CRC	Crude Genetics	WClivbr	WClivbr	LivBr
			CBR CIR CDR CDRn				%=F2 Wcbr			

Cervus eldi thamin/BURMESE BROW-ANTLERED DEER/
 ISIS Global: 13 71.82.1
 Age Distribution: 0 | 24% 0% 18% 43% 0% 1.001 69% 3 2 0 52
 |100 age classes....

Cervus mariannus (no subsp)/SAMBAR/
 ISIS Global: 0 0.0.0
 Age Distribution: 0 | 0% 0% 0% 0% 0% 0.000 0% 0 0 0 0

Cervus mariannus mariannus/SAMBAR/
 ISIS Global: 0 0.0.0
 Age Distribution: 0 | 0% 0% 0% 0% 0% 0.000 0% 1 0 0 0

Cervus mesopotamicus/PERSIAN FALLOW DEER/
 ISIS Global: 4 41.10.1
 Age Distribution: 0 | 23% 0% 1% 0% 0% 1.190 6% 0 0 0 3
 |100 age classes....

Cervus nippon (no subsp)/SIKA DEER/
 ISIS Global: 20 51.102.28
 Age Distribution: 0 | 29% 0% 11% 16% 0% 1.038 11% 42 4 3 31
 |100 age classes....

Cervus nippon (no subsp)/ <<< Hybrid >>> /SIKA DEER/
 ISIS Global: 0 0.0.0
 Age Distribution: 0 | 0% 0% 0% 0% 0% 0.000 0% 0 0 0 0

Cervus nippon nippon/SIKA DEER/
 ISIS Global: 3 7.9.0
 Age Distribution: 0 | 13% 0% 7% 0% 0% 0.900 12% 1 1 3
 |100 age classes....

Cervus nippon dybowskii/SIKA DEER/
 ISIS Global: 6 11.21.4
 Age Distribution: 0 | 42% 0% 17% 12% 0% 1.062 17% 2 2 11
 |100 age classes....

Cervus nippon mandarinus/SIKA DEER/
 ISIS Global: 1 3.4.0
 Age Distribution: 0 | 23% 0% 0% 0% 0% 0.833 0% 0 0 0 0
 |100 age classes....

Cervus nippon mantschuricus/SIKA DEER/
 ISIS Global: 1 0.2.0
 Age Distribution: 0 | 23% 0% 40% 40% 0% 0.785 0% 2 0 1
 |100 age classes....

Cervus nippon pseudaxis/SIKA DEER/
 ISIS Global: 4 24.23.0
 Age Distribution: 0 | 43% 0% 24% 38% 0% 1.135 40% 0 0 19
 |100 age classes....

Taxon	Number of Collections	31/12/1992 Census	Crude Demographics CBR CIR CDR CDRn CER CRC	Crude Genetics %>F2 WCliv WClivbr LivBr
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Cervus nippon taiwanus/SIKA DEER/
 ISIS Global: 9 25.78.5 30% 0% 20% 37% 0% 0.987 11% 2 0 0 29
 Age Distribution: 0

Cervus porcinus (no subsp)/HOG DEER/
 ISIS Global: 8 39.53.6 43% 0% 14% 17% 0% 1.177 7% 3 0 0 14
 Age Distribution: 0

Cervus porcinus porcinus/HOG DEER/
 ISIS Global: 2 8.12.0 44% 0% 26% 28% 0% 1.070 10% 0 0 0 6
 Age Distribution: 0

Cervus porcinus calamianensis/CALAMIAN DEER/
 ISIS Global: 1 2.0.0 20% 0% 0% 0% 0% 0.800 0% 0 0 0 0
 Age Distribution: 0

Cervus porcinus kuhlii/BAWEAN DEER/
 ISIS Global: 1 1.5.0 16% 0% 14% 10% 0% 0.931 17% 0 0 0 2
 Age Distribution: 0

Cervus timorensis (no subsp)/TIMOR DEER/
 ISIS Global: 2 6.6.1 38% 12% 1% 4% 0% 1.316 0% 2 0 0 1
 Age Distribution: 0

Cervus timorensis timorensis/TIMOR DEER/
 ISIS Global: 0 0.0.0 0% 0% 0% 0% 0% 0.400 0% 0 0 0 0
 Age Distribution: 0

Cervus timorensis russa/JAVAN RUSA/
 ISIS Global: 1 2.10.0 24% 0% 23% 39% 0% 0.866 0% 1 1 1 5
 Age Distribution: 0

Cervus unicolor (no subsp)/SAMBAR/
 ISIS Global: 6 32.52.0 30% 0% 20% 43% 0% 1.073 35% 2 0 0 36
 Age Distribution: 0

Cervus unicolor malaccensis/SAMBAR/
 ISIS Global: 2 7.15.1 50% 0% 25% 33% 0% 1.046 43% 0 0 0 10
 Age Distribution: 0

Cervus unicolor niger/SAMBAR/
 ISIS Global: 1 8.7.0 44% 0% 23% 53% 0% 1.216 60% 0 0 0 4
 Age Distribution: 0

Taxon Number of Collections 31/12/1992 Census Crude Demographics Crude Genetics
 CBR CIR CDR CDRn CER CRC %>F2 WCliv WClivbr LivBr

Cervus alfredi/PRIMER ALFRED'S SPOTTED DEER/
 ISIS Global: 1 5.5.0
 Age Distribution: 0 15% 17% 3% 0% 0% 1.157 0% 2 5 3

Elaphurus/DEER, PERE DAVID'S/genus

Elaphurus davidianus/PERE DAVID'S DEER/
 ISIS Global: 35 132.234.31
 Age Distribution: 0 22% 0% 9% 15% 0% 1.062 41% 4 2 1 121

Alces/MOOSE/genus

Alces alces (no subsp)/MOOSE/
 ISIS Global: 5 12.14.1
 Age Distribution: 0 18% 26% 37% 10% 0% 0.984 11% 7 11 0 4

Alces alces (no subsp) / <<< Hybrid >>> /MOOSE/
 ISIS Global: 1 10.1.3
 Age Distribution: 0 0% 0% 0% 0% 0% 1.000 0% 0 0 0 1

Alces alces alces/EUROPEAN ELK/
 ISIS Global: 7 11.12.0
 Age Distribution: 0 14% 5% 6% 35% 0% 1.077 17% 2 7 0 6

Alces alces americana/MOOSE/
 ISIS Global: 6 7.3.0
 Age Distribution: 0 15% 32% 36% 17% 0% 0.911 0% 23 8 4 4

Alces alces andersoni/MOOSE/
 ISIS Global: 4 6.2.1
 Age Distribution: 0 11% 32% 26% 60% 0% 1.070 33% 2 6 1 2

Alces alces gigas/ALASKAN MOOSE/
 ISIS Global: 2 2.2.0
 Age Distribution: 0 0% 65% 4% 0% 0% 1.210 0% 0 4 0 0

Alces alces shirasi/SHIRA'S MOOSE/
 ISIS Global: 0 0.0.0
 Age Distribution: 0 0% 0% 0% 0% 0% 0.000 0% 0 0 0 0

Blastoceros/DEER, PAMPAS/genus

Blastoceros campestris (no subsp)/PAMPAS DEER/

Age Distribution Percentiles: █ > 80th, █ > 60th, █ > 40th, █ > 20th

Taxon	Number of Collections	31/12/1992 Census	Crude Demographics				Crude Genetics						
			CBR	CIR	CDR	CDRn	CER	CRC	%>F2	WCbr	WCliv	WClivbr	LivBr
Age Distribution: 0	1	0.1.0	0%	0%	0%	0%	0%	1.000	0%	0	0	0	0
		ISIS Global:	100 age classes...										

Blastoceros campestris campestris/PAMPAS DEER/

ISIS Global: 0 0.0.0 0% 0% 0% 0% 0% 0% 0.000 0% 1 0 0 0 0

Blastoceros campestris bucoaster/PAMPAS DEER/

ISIS Global: 2 4.9.1 34% 0% 17% 27% 0% 1.153 29% 0 0 0 0 4

Blastocerus/DEER, SWAMP/genus

Blastocerus dichotomus/SWAMP DEER/ IUCN Red List: Vulnerable in wild

ISIS Global: 1 1.3.0 22% 0% 0% 0% 0% 1.050 0% 3 0 0 0 0

Capreolus/DEER, ROE/genus

Capreolus capreolus (no subsp)/ROE DEER/

ISIS Global: 1 1.1.0 13% 13% 28% 20% 0% 0.890 0% 3 0 0 0 0

Capreolus capreolus capreolus/ROE DEER/

ISIS Global: 6 14.18.0 34% 16% 28% 32% 0% 1.093 16% 14 13 6 10

Capreolus capreolus pygargus/ROE DEER/

ISIS Global: 0 0.0.0 0% 0% 0% 0% 0% 0.000 0% 0 0 0 0 0

Hippocamelus/GUEMAL/genus

Hydropotes/DEER, CHINESE WATER/genus

Hydropotes inermis (no subsp)/CHINESE WATER DEER/

ISIS Global: 7 12.11.0 52% 1% 31% 28% 0% 0.932 61% 5 0 0 0 10

Hydropotes inermis inermis/CHINESE WATER DEER/

ISIS Global: 2 5.11.0 66% 0% 59% 37% 0% 0.987 25% 3 0 0 0 7

Age Distribution Percentiles: ■ > 80th, ■■ > 60th, ■■■ > 40th, ■■■■ > 20th


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=====
Taxon                               Number of Collections  31/12/1992 Censu
=====
Crude Demographics                    Crude Genetics
CBR  CIR  CDR  CDRn  CER  CRC  %>=F2  WcBr  WcLiv  WcLivBr  LivBr
=====

```

```

Odocoileus virginianus seminola/WHITETAIL DEER/
  ISIS Global: 1 0.3.0
Age Distribution: 0 |.....| 0% 20% 0% 0% 0% 1.000 0% 2 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0

Odocoileus virginianus sinaloae/WHITETAIL DEER/
  ISIS Global: 1 8.16.0
Age Distribution: 0 |.....| 73% 7% 52% 39% 0% 1.280 29% 7 3 2 8
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0

Odocoileus virginianus texana/WHITETAILED DEER/
  ISIS Global: 4 7.17.0
Age Distribution: 0 |.....| 35% 3% 7% 7% 0% 0.961 4% 19 8 6 11
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0

Odocoileus virginianus truei/WHITETAILED DEER/
  ISIS Global: 1 0.1.0
Age Distribution: 0 |.....| 0% 0% 0% 0% 0% 0.400 0% 2 1 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0

```

Pudu/pudu/genus

```

Pudu mephistophiles (no subsp)/PUDU/UCN Red List: Indeterminate Status in wild
  ISIS Global: 0 0.0.0
Age Distribution: 0 |.....| 0% 0% 0% 0% 0% 0.000 0% 0 0 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0

```

Pudu pudu/PUDU/

```

Age Distribution: 0 |.....| 32% 2% 18% 17% 0% 1.069 58% 13 1 1 47
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0

```

Rangifer/CARIBOU, REINDEER/genus

```

Rangifer tarandus (no subsp)/REINDEER/
  ISIS Global: 37 48.161.0
Age Distribution: 0 |.....| 34% 1% 23% 29% 0% 1.000 23% 36 15 7 83
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0

```

Rangifer tarandus (no subsp)/ <<< Hybrid >>> /REINDEER/

```

Age Distribution: 0 |.....| 0% 0% 0% 0% 0% 0.000 0% 0 0 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0

```

Rangifer tarandus tarandus/EURASIAN TUNDRA REINDEER/

```

Age Distribution: 0 |.....| 34% 0% 13% 10% 0% 1.159 0% 4 0 0 4
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0

```

Rangifer tarandus caribou/AMERICAN WOODLAND CARIBOU/

```

Age Distribution: 0 |.....| 33% 2% 30% 29% 0% 0.967 28% 36 11 11 28
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0
                  |.....| 0% 0% 0% 0% 0% 0% 0% 0 0 0

```

Age Distribution Percentiles: █ > 80th, █ > 60th, █ > 40th, █ > 20th

GLOBAL

CAPTIVE ACTION PLAN

FOR

CERVIDS

San Diego, CA
18 - 20 March 1993

BRIEFING BOOK

SECTION 4

CERVID CAMP SPREADSHEETS

CHARACTERISTICS OF CRITICALLY ENDANGERED CERVID TAXA.

SPECIES	RANGE	NUMB	SUBS	TREN	AREA	THREAT	PVA	MGMT	TAX	SURV	CAP N	CAP REC
Moschus berezovskii caobangis	China	<2,500	Y	D	A	H3, E3	Y	4	Y	Y	0	90/100 I
Muntiacus crinifrons crinifrons	China	<6,000	Y	D	A	H3, E3	Y	4	N	Y	4	90/100 I
Ozotocerus bezoarticus celer	Argentina	< 400	2+	I-S	ISO	H3,E1,D?	Y	2/4	Y	Y	9	90/100 I
Dama dama mesopotamica	Iran	< 200	2	D	A	H3, E3	N	3	Y	N	100, 8	Y
Axis calamanensis	Calamian Is	500-1000	2+	d	25 K2	H3, C2, E3		3/4	Y	Y	25?	90/100 II
Axis kuhli kuhli	Bawean Isl	< 500	1	S	AA 200	ISL POP	Y	2/3	Y	N	50I, 50W	Y
Cervus alfredi	Philippines	< 500	2+	D	<500 K2	H3,E3,X		4	Y	Y	30+	90/100 I
Cervus duvauceli branderi	India	< 700	1	D?	A <1000	H3, PI	N	3	N	N	0	?
Cervus eldi eldi	India	80	1	S	A 14K2	H3E1PID3	Y	3	N	N	90	90/100 I
Cervus eldi (hainanus)	Hainan Isl	200-300	2	S	AA <100	H3	Y	2	Y	N	0	?
Cervus nippon mandarinus	China	EXT WILD							Y	Y	100+	?
Cervus nippon sichuanicus	China	UNKNOWN	1	D	A	E3	Y			Y	0	?
Cervus nippon taiwanus	Taiwan	EXT WILD	1	U	20 K2	X3	Y	1	Y	N	100	90/100 I
Cervus nippon pseudaxis	Vietnam	EXT WILD		S-C		X3,H3	Y	N	Y	N	200-3000?	90/100 I
Cervus nippon keramae	Keramae Isl	50	4	D	AA		Y	4	Y	Y	0	90/100 I
Cervus elaphus hanglu	Kashmir	800	2	D	A	H3E3D2C2	N	2	N	N	< 10	90/100 I
Cervus elaphus wallichi*	China	UNK-LOW		U	A	E3	Y	4	Y	Y	?	90/100 I
Cervus elaphus affinis*	China	UNK-LOW		U	A	E3	Y	4	Y	Y	?	?
Odocoileus hemionus cerrogensis	Mexico	100	N	D	35 K2	E		3	Y	Y		Nuc I

* May be consubspecific.

CHARACTERISTICS OF ENDANGERED CERVID TAXA.

SPECIES	RANGE	CENSUS	SUB POP	TREND	AREA	THREAT	PVA	MGM	TAX	SURV	CAP N	CAP REC
Moschus berezovskii berezovskii	China	>10,000	>6	D	B	H2,E3	Y	4	Y	Y	20+	NUC-I
Moschus berezovskii anhuenensis	China	UNK	#?	D	A	H2,E3	Y	4	Y	Y	0	?
Moschus fuscus fuscus	China	UNK	?	D	A	H2,E3	Y	4	Y	Y	0	NUC-II
Moschus chrysogaster (s6)	China, Bh, Ne, In, Pa	>50,000	Y-MANY	D	C	H13;E23	Y	2/4	Y	Y	30+	NUC-II
Moschus moschiferus parvipes	Korea, China	UNK	?	D	B	H2,E3	Y	4	Y	Y	0	NO
Moschus moschiferus sachalinensis	Russia	<2,500	?	D	AA	?	Y	2	Y	N	0	NO
Muntiacus feai	Thailand, Burma	<10,000	Y #?	D?	A	H1,E2	N	?	N	Y	18	Y?
Muntiacus gongshanensis	China, Burma	<10,000	Y	D	A	H3,E3	Y	4	N	Y	0	90/100-I
Hippocamelus bisculus	Chile, Argentina	2,000	15+	D	UNK	H3C3D2E2	Y	4	N	Y	0	90/100-II
Ozotocerus bezoarticus bezoarticus	Braz, Para, Urug	2000	10+	D	ISOL	C3H2E2D1	Y	4	Y	Y		90/100-I
Ozotocerus bezoarticus leucogaster	Eol, Bra, Par, Urug	1000	?	D	ISOL	C3E2H2D1	Y	4	Y	Y	96	90/100-I
Odocoileus virginianus clavium	USA	300-400	N	S-D	ISL	L, ROAD	PUB	2	Y	N	3	NUC-I
Rangifer tarandus caribou	Canada, USA	<50,000	Y-MANY	D		E, H, LOG		3	Y	Y		
Rangifer tarandus pearyi	Canada	<3,500	Y	D-S	>1M K2	WEATHER	Y	3	Y	N	0	?
Dama dama dama	Turkey (Orig wp)	700	1	S	A	E2,X3,D?						
Cervus mariannus barandanus	Philippines	<1,000	Y	D	<500K2	H3,E3			Y	Y	0?	90/100-II
Cervus mariannus nigricans	Philippines	<1000	Y	D	<10000	H3,E3			Y	Y	<100	90/100-I
Cervus unicolor swinhoei	Taiwan	<10,000	Y	D	A	H2,E3	N	4	N	Y	30	90/100-I
Cervus duvauceli duvauceli	Nepal, India	3,000	5	D	A <1000	H2,P1	N	2	Y*	N	0	NUC-II
Cervus duvauceli ranjitsinhi	India	2-3,000	Y	D	A <1000	H1,E3,PO	N	3	N	N	0	
Cervus eldi siamensis	Laos, Camb, Viet	UNK	Y-MANY	D	UNK	H3,E3	Y	4	N	Y	<20	90/100-I
Cervus albirostris	Tibet	<10,000	10+	D	A	E3,X3	Y	4	N	DON	13	90/100-II
Cervus elaphus barbarus	Alg, Tunisia	2,500	+	S	A	FIRE-3	N	2	N	N	+50	90/100-II
Cervus elaphus corsicanus	Corsica, Sardin	200	2	I	A	E3,X3	Y?	2	Y		0	NO
Cervus elaphus bactrianus	USSR	2,500	Y	I	A	H3PI,E	N	2	N	N	25+	90/100-I
Cervus elaphus macneilli	China	UNK	Y	D?	A	E3	Y	4	N	Y	5	90/100-I
Cervus elaphus hispanicus	Spain	<1,000?		D		X3	Y		Y			90/100-I
Cervus elaphus nannodes	USA	500		I	>1 K2		2	Y	N			NO
Elaphus davidianus davidianus	China	REINTRO 4200	3	I	A 10K	GENETIC	Y	3	N	N	1000+	90/100-I

MAINLAND ASIA: INCLUDING THE PACIFIC ISLANDS OF THE USSR, HAINAN,
JAPAN AND TAIWAN

<u>SPECIES</u>	<u>SUBSPECIES</u>	C	<u>STATUS</u>		S	U
			E	V		
Moschus berezovskii						
	berezovskii		e			
	caobangis	c				
	anhuiensis		e			
fuscus						
	fuscus		e			
	spp			v		
chrysogaster						
	chrysogaster		e			
	sifanicus		e			
	cupreus		e			
	leucogaster		e			
moschiferus						
	moschiferus				s	
	parvipes		e			
	sachalinensis		e			
Hydropotes inermis						
	inermis			v		
	argyropus					u
Elaphodus cephalophus						
	cephalophus			v		
	michianus			v		
	ichangensis			v		
	fociensus			v		
Muntiacus reevesi						
	reevesi				s	
	micrurus			v		
feai						
	feai		e			
	rooseveltorum					u
gongshanus			e			
crinifrons		c				
muntjak						
	muntjak				s	
	vaginalis				s	
	aureus				s	
	malabaricus				s	
	curvostylis				s	
	anamensis				s	
	menglalis					u
	yunnanensis					u
	nigripes			v		

Capreolus pygargus

pygargus			s	
tianschanicus			s	
bedfordi			s	
spp (Tibet)				u

Alces alces

alces			s	
cameloides		v		
buturlini			s	
pfizenmayeri			s	

Rangifer tarandus

valantinae				u
angustrostris				u
phylurchus				u

Axis porcinus

porcinus		v		
annamiticus				u

axis

s

Cervus mariannus

boninensis				u
------------	--	--	--	---

unicolor

unicolor			s	
cambojensis			s	
dejeani		v		
equinus			s	
hainana				u
swinhoei		e		

duvauceli

duvauceli			e	
branderi	c			
ranjitsinhi			e	

eldi

eldi	c			
thamin		v		
siamensis	c			

albirostris

e

nippon

mandarinus	c			
mantchuricus		v		
grassianus				u
sichuanicus	c			
yesoensis		v		
taiouanus	c			
pseudaxis	c			
nippon			s	

INSULAR ASIA: INDONESIA AND THE PHILIPPINES

<u>SPECIES</u>	<u>SUBSPECIES</u>	C	<u>STATUS</u>		S	U
			E	V		
Muntiacus atherodes					S	
	muntjak montanus			V		
Axis kuhli		C				
	calamianensis	C				
Cervus alfredi		C				
	mariannus mariannus			V		
	barandanus		E			
	nigricans		E			
	nigellus			V		
	unicolor brookei					U
	timorensis				S	
	rusa					U
	renschii					U
	floresiensis					U
	timorensis					U
	macassaricus					U
	djonga					U
	moluccensis					U
	nippon soloensis					U

Total of 9 species, 14 subspecies: critical - 3
 endangered - 2
 vulnerable - 3
 safe - 2
 unknown - 8

SOUTH AMERICA: GUATAMALA TO THE STRAITS OF MAGELLAN

<u>SPECIES</u>	<u>SUBSPECIES</u>	C	<u>STATUS</u> E V	S	U
Mazama gourzourbira					
	gourzourbira				u
	argentina				u
	cita				u
	mexiana				u
	murelia				u
	nemorivaga				u
	permira				u
	sanciaemariae				u
	tschudii				u
americana					
	americana				u
	carrikeri				u
	gualea				u
	trinitatis				u
	zamora				u
	jucunda				u
	sheila				u
	zetta				u
	rosii				u
	toba				u
	sarae				u
	superciliaris				u
	whitelyi				u
nana					u
rufina					
	rufina				
	bricenii		v		
chunyi					u
Pudu pudu					
mephistopheles				v	
Hippocamelus antisensis					u
bisculus			e		
Blastocerus dichotomus				v	
Ozotoceros bezoaticus					
	bezoarticus		e		
	celer	c			
	luecogaster		e		
Odocoileus virginianus					
	tropicalis				u
	gymnotis				u
	curassavicus				u

EUROPE WEST TO THE URALS, NORTH AFRICA, THE MIDDLE EAST AND CENTRAL ASIA

<u>SPECIES</u>	<u>SUBSPECIES</u>	C	<u>STATUS</u>		S	U
			E	V		
Capreolus capreolus	capreolus				S	
	coxi				S	
	spp. (S. Spain)	c				
Alces alces	alces				S	
Rangifer tarandus	tarandus				S	
	fennicus			v		
	platyrhynchus				S	
Dama dama	dama (Turkey)		e			
	mesopotamica	c				
Cervus elaphus	elaphus				S	
	hippelaphus				S	
	atlanticus				S	
	montanus				S	
	scoticus				S	
	corsicanus		e			
	hispanicus		e			
	maral				S	
	barbarus		e			
Total of 5 species, 18 subspecies:			critical - 2			
			endangered - 4			
			vulnerable - 1			
			safe - 11			
			unknown - 0			

CENTRAL AMERICA:

<u>SPECIES</u>	<u>SUBSPECIES</u>		<u>STATUS</u>		
Mazama americana		C	E V	S	U
	cerasina				u
	reperticia				u

Odocoileus virginianus	thomasi				
	nelsoni			S	
	nemoralis			S	
	chiriquensis			S	
	rothschildi			S	
			V		

Total of 2 species, 7 subspecies: critical - 0
 endangered - 0
 vulnerable - 1
 safe - 4
 unknown - 2

NORTH AMERICA: MEXICO, US AND CANADA

<u>SPECIES</u>	<u>SUBSPECIES</u>	C	<u>STATUS</u>		S	U
			E	V		
Mazama americana						
	temama					u
	pandora					u
Rangifer tarandus						
	caribou		e			
	osborni			v		
	groenlandicus				s	
	caboti				s	
	terranovae				s	
	pearyi		e			
Cervus elaphus						
	canadensis				s	
	nannodes		e			
Odocoileus virginianus						
	cousei					u
	carminus				s	
	virginianus				s	
	ochrourus					u
	leucurus			v		
	texanus				s	
	macrourus					u
	mcilhennyi				s	
	taurinsulae					u
	clavium		e			
	borealis				s	
	dacotensis				s	
	hiltonensis				s	
	nigribarbis				s	
	osceola				s	
	seminolus				s	
	venatorius				s	
	miquihuanensis				s	
	toltecus					u
	mexicanus					u
	oaxacensis				s	
	sinaloae				s	
	acapulcensis				s	
	thomasi				s	
	nelsoni				s	
	yucatanensis				s	
	veraecrucis					u
Odocoileus hemionus						
	columbianus				s	
	sitkensis				s	
	hemionus				s	
	eremicus				s	

californicus		s	
fuliginatus		s	
peninsulae			u
inyoensis			u
crooki		s	
sheldoni			u
cerrosensis	c		

Alces alces

americana		s	
andersoni		s	
shirasi		s	
gigas		s	

Total of 6 species, 52 subspecies:

critical	- 1
endangered	- 4
vulnerable	- 2
safe	- 33
unknown	- 12

GLOBAL

CAPTIVE ACTION PLAN

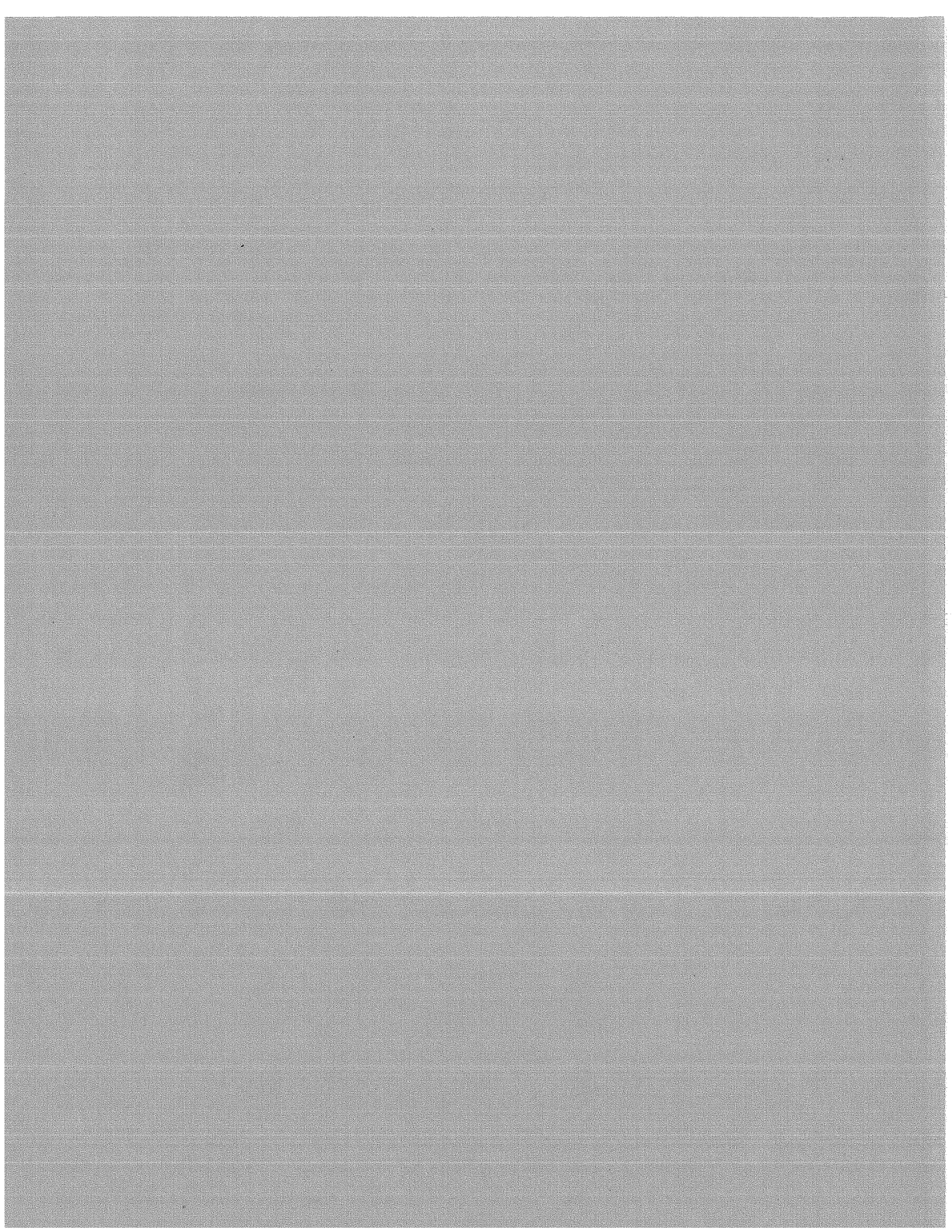
FOR

CERVIDS

San Diego, CA
18 - 20 March 1993

BRIEFING BOOK

SECTION 5
CERVID GCAP TABLES (BLANK)



GLOBAL

CAPTIVE ACTION PLAN

FOR

CERVIDS

San Diego, CA
18 - 20 March 1993

BRIEFING BOOK

SECTION 6

ROUGH DRAFT ACTION PLAN FOR CERVIDS

DEER

An Action Plan for the Conservation

of the Family Cervidae, Moschidae,

and

Asian Tragulidae

Edited by

Chris Wemmer
Chairman, IUCN/SSC Deer Specialist Group

Contents

Foreword

Acknowledgements

Introduction

Background

Objectives

Methodology

List of Cervid Taxa

South America: Status Report and Recommended Conservation Action

Dietland Muller-Schwarze and Don Moore

Introduction

Critical Status

Ozotocerus bezoarticus celer

Endangered Status

Hippocamelus bisulcus

Ozotocerus bezoarticus bezoarticus

Ozotocerus bezoarticus leucogaster

North America: Status Report and Recommended Conservation Action

Val Geist, Chris Wemmer, Dale Miquelle, and Dan Wharton

Introduction

Endangered Status

Odocoileus virginianus clavium

Odocoileus hemionus cerrosensis

Rangifer tarandus caribou

Rangifer tarandus pearyi

Cervus elaphus nannodes

Europe and the Near East: Status Report and Recommended Conservation Action

George Schwede and Jim Dolan

Introduction

Critical Status

Dama dama mesopotamica
Cervus elaphus hispanicus

Endangered Status

Moschus moschiferus sachalinensis
Cervus elaphus corsicanus
Cervus elaphus bactrianus
Dama dama dama

Mainland Asia: Status Report and Recommended Conservation Action

Michael Green, Roland Wirth, William Oliver, Georg Schwede, and Jim Dolan

Introduction

Critical Status

Moschus berezovskii caobangis
Muntiacus crinifrons crinifrons
Axis kuhli kuhli
Cervus alfredi alfredi
Cervus unicolor equinus
Cervus duvacei branderi
Cervus eldi eldi
Cervus eldi
Cervus nippon mandarinus
Cervus nippon sichuanicus
Cervus nippon taiouanus
Cervus nippon pseudaxis
Cervus nippon keramae
Cervus elaphus hanglu
Cervus elaphus wallichi
Cervus elaphus affinis (China)

Endangered Status

Moschus berezovskii berezovskii
Moschus berezovskii anhulensis
Moschus fuscus fuscus
Moschus chrygaster ssp
Moschus moschiferus parvipes
Axis calamianensis calamianensis
Cervus marianus barandanus
Cervus marianus nigricans
Cervus unicolor swinhoei
Cervus duvauceli duvauceli
Cervus duvauceli ranjitsinhi

Cervus eldi siamensis
Cervus albirostris albirostris
Cervus nippon yesoensis
Cervus elaphus macneilli
Elaphus davidianus davidianus

Threatened Status

Muntiacus feai feai
Muntiacus gongshanus

Position Statements

Introduction of Alien Cervids
Human Utilization of Cervids
Deer Farming

References

Appendix 1. List of Deer Specialist Group Members

Appendix 2. List of Action Planning Group

Appendix 3. List

Foreword (George Rabb or Tim Clutton-Brock)

Acknowledgements

This action plan is the product of cooperative effort. Dr. Michael J.B. Green, Vice Chairman of the group has been a faithful colleague and a conscientious correspondent, and played a major role in designing the Species Report Forms. In various ways, Dr. Ulysses S. Seal has supported my efforts as Chairman of the group, and together with Dr. Leslie Johnston provided invaluable assistance in summarizing the status reports, and classifying threatened species. A number of biologists, not all of whom are members of the DSG, contributed significantly to the preparation of this document, some at their own expense. In particular, I would like to mention Drs. James Dolan, Dale Miquelle, Georg Schwede, Dan Wharton, and Don Moore. Simon Stuart and George Rabb have consistently supported our efforts and directed information to our attention.

We gratefully acknowledge the conscientious efforts of our numerous foreign correspondents who provided the information used to compile the status reports. All these correspondents have been cited in the species accounts. Last, we wish to acknowledge the skillful participation of Laura Walker, who, besides copying and mailing DSG newsletters, has played an indispensable role in so many aspects of the program, from mailing report forms and typing the returns, to formatting and doctoring the Action Plan drafts.

Lastly, the convening of our Action Planning workshop would not have been possible without the support of the Peter Scott Action Plan Fund. We are grateful to the IUCN Species Survival Commission for the assistance.

Introduction

What thoughts and sentiments have accompanied the passing of species? On the vast pampas of South America, the gauchos surely mourned the loss of the cervo de pantanos, and the middle men who bartered in hides and meat, no doubt grieved their losses. The times were good, but there were always other things too, and it seems there have only been a handful of men and women who felt a deep seated loss when the spectacle of hundreds of thousands of bison passed from the scene, and bereft of its rolling masses, the plains became silent and the world lost a magnificent spectacle and a gift.

But several times during the past century, a sense of helplessness and anger have begotten action which stemmed the tide of extinction. The passing of our own generation may usher the disappearance of many species of large mammals, and among this group of mammals the deer measure prominently.

As a natural resource, deer have played a prominent role in the peopling of the continents, and among large probably more species of deer have been managed successfully than other groups of large vertebrates. From the biological perspective however there are some detractors. Wildlife management agencies have mixed subspecies, and the desire for large trophies has inspired some states to the ignorant mixing of subspecies; the same unexplainable motive that has lead to the development of monstrosities of dogs threatens to domesticate populations of white-tailed deer in the United States.

This action plan identifies 45 species of deer-- 26% of the living species, that are threatened with extinction. If you consider subspecies, __ % are threatened. Asia, the center of their adaptive radiation contains __ % of the species, while South America has the greatest endemism.

The DSG Action Plan is a document intended to:

- 1) increase awareness of threatened species of deer, and the circumstances leading to their loss;
- 2) to present current information on the status of threatened deer;
- 3) to present position statements on issues crucial to the conservation of threatened deer and the continued survival of wild deer populations;
- 4) to recommend specific action for the conservation of threatened species of deer;
- 5) to provide essential information for the preparation of proposals to fund specific AP initiatives.

The DSG Newsletter serves an important ancillary function by communicating updates on group activities and AP progress to the membership.

Methodology

Method is central to science and conservation, and the following paragraphs describe the stages leading to the production of this action plan.

Data Collection. Work on the Action Plan began in 1989 with the preparation of the Species Report Form (Appendix). To the Regional Coordinators we delegated the responsibility of mailing the Species Report Forms to field contacts, and most forthcoming responses were received within a year, at which time follow-up mailings were made. Other contacts were discovered in the course of the process which lead to additional mailings. In response to our call for information, some contacts requested funds for xeroxing and postage, which could not be obtained except from personal sources. Much of the information contained in the Report Forms was word-processed by Laura Walker before the meeting.

Analysis and Writing. In August 1991 a one-week workshop was convened at the National Zoo's Conservation and Research Center to draft the Action Plan; not all regional coordinators could participate in the meeting, but 14 members and correspondents, some of whom were fortuitously in the Washington metropolitan area at the time, devoted long hours to the compilation of data using six microcomputers. Dr. Uly Seal played a vital role in directing the compilation of the data to determine the threatened status of taxa; we decided not to adopt a numerical system, and relied primarily on information concerning size, extent and fragmentation of populations.

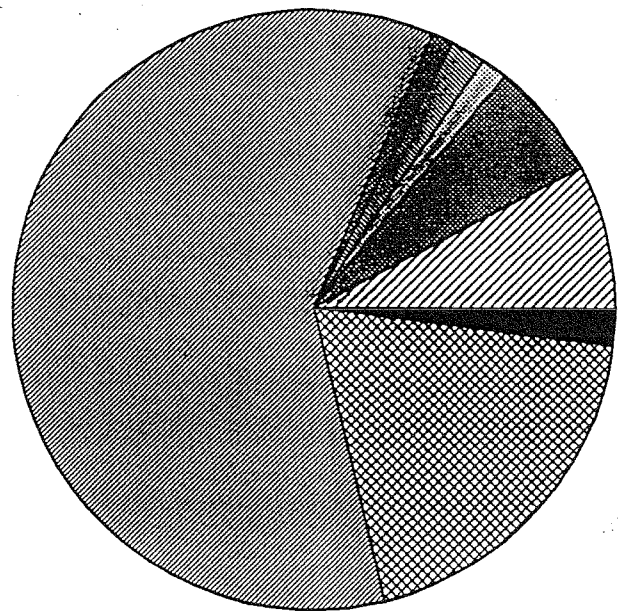
Most major sections of the Action Plan were drafted during the workshop. Using Report Forms and other references, we began by compiling information on status using the Mace-Lande criteria (1991). However, in many instances, insufficient information demanded a discomfiting reliance on subjectivity, and required subsequent time-consuming verification. When there were insufficient data, the species or population was classified as indeterminate. In addition, we debated critical issues regarding taxonomy, deer farming, and sustainable resource management, and as a result drafted the DSG position statements, which were subsequently reviewed by the membership.

Conservation Recommendations. To foster use of a consistent systematic process between workers in defining conservation action, Dale Miquelle, Eric Dinerstein, and I designed a simple decision model (Figure). The intention was to prescribe the types of conservation action normally proposed to ameliorate particular threats, with the expectation that regional specialists would elaborate upon actions based on personal knowledge of the environmental, bureaucratic and political context. Wherever possible, these considerations are reflected in the prescribed actions. The socio-political systems served by action plans show great diversity, and for that reason generalized solutions do not carry the day. The Actions proposed herein, therefore are intended as guidelines for more detailed proposals. In essence they are first approximations.









Implementation. The implementation of action plans remains a major challenge to the SSC because specific mechanisms are lacking and the process is relatively new. The increase in the number of SSC action plans provides opportunities to expand conservation planning but also runs a certain risk of duplication and uncoordinated conservation action. To avoid this situation, we recommend that SSC groups identify within each action plan other SSC groups with which conservation programs should be linked. Linkage may follow taxonomic or ecological similarities (e.g. large ungulates) or geographic overlap. SSC regional action plans will likely address this issue but delays in their publication and implementation remain a concern for all involved. We will attempt to coordinate specific actions within a country for other taxonomically related SSC groups.

The full financial requirement for any Action Plan is a major administrative task and a daunting challenge for a volunteer group. What's more, few SSC Chairmen have the institutional support and time to coordinate and direct the many initiatives emanating from an Action Plan. While some may argue that it isn't necessary, the other view is that progress will not occur without proactive

direction. The invention of an effective mechanism remains to be discovered. Because funding agencies tend to be geographically divided, coordinated fund-raising should have a regional rather than global focus.



Legend

-  **Perissodactyl**
-  **Suidae etc**
-  **Camillidae**
-  **Tragulidae**
-  **Giraffidae**
-  **Bovidae**
-  **Cervidae**
-  **Moschidae**

DSG responsible for 26% of total 175 species

LIST OF DEER SPECIES AND SUBSPECIES
(corrected version 27/08/91)

by Peter Grubb, Alfred Gardner, Valerius Geist

The taxonomic status of the Cervidae at the genus and species levels is generally accepted (Groves and Grubb 1987). The taxonomic status of named populations (subspecies) is uncertain, and comprehensive evaluation and revisions are needed. This is a compilation of names in the scientific literature; however they have not been taxonomically evaluated. The lack of consensus concerning the validity of subspecies level taxa has not deterred us from our task of evaluating the conservation status of the Cervidae. As a matter of principle the units of conservation are significant geographic or genetic populations, rather than formal taxonomic entities.

Moschus berezovskii, **Forest musk deer**

berezovskii Flerov, 1929, China (Shaanxi, Hubei, Sichuan, Gansu, Tibet ?)
caobangis Dao, 1969, Vietnam, China (Guanxi, Yunnan)
anhuiensis Wang, Hu & Yan, 1982, China (Anhui)

Moschus fuscus, **Black musk deer**

fuscus Li, 1981, China (Yunnan, Tibet), Burma, 'Assam'.
ssp. nov., Everest/Khumbu race, Nepal, Sikkim, Bhutan.

Moschus chrysogaster (*chrysogaster* ssp. group), **Alpine musk deer**

chrysogaster Hodgson, 1939, China (Tibet), Sikkim
sifanicus Przewalskii, 1888, or Buchner, 1890, China (Qinghai, Sichuan)

ssp. nov., Gongshan race, China (Yunnan)

Moschus chrysogaster (*leucogaster* ssp. group), **Himalayan musk deer**

cupreus Grubb, 1982, Kashmir, Pakistan, Afghanistan
leucogaster Hodgson, 1939, Nepal, Sikkim
ssp. nov., Kulu race, India
ssp. nov., Zhangmu/Khumjung race (*chrysogaster* of Cai & Feng 1981), China (Tibet), Nepal

Moschus moschiferus, **Siberian or Taiga musk deer**

moschiferus Linnaeus, 1758, USSR, Mongolia, China (Sinkiang)
parvipes Hollister, 1911, Korea, China (Heilongjiang, Jilin, Hebei, Shanxi)
sachalinensis Flerov, 1929, USSR (Sakhalin)

Hydropotes inermis, **Chinese water deer** (introduced to Britain, France)

inermis Swinhoe, 1870, China
(*argyropus* Heude, 1884, Korea) ? probably invalid as a taxon.

Elaphodus cephalophus, **Tufted deer**

cephalophus Milne-Edwards, 1871, Burma, China (Sichuan, Yunnan)
(*michianus* (Swinhoe, 1874), China (Zhejiang, Fujian)? doubtful
(*ichangensis* Lydekker, 1904, China (Hubei)? doubtful
(*fociensis* Lydekker, 1904, China (Fujian)? doubtful

Cervus (Cervus) nippon, Sika (introduced to Britain, Ireland, USA, Madagascar, Denmark, France, Germany, Czechoslovakia, Azerbaijan, Oshima I. in Japan).

mantchuricus Swinhoe, 1864; USSR.

mandarinus Milne-Edwards, 1871, syn. *hortulorum* Swinhoe, 1864, China.

grassianus (Heude, 1884), China (extinct ?)

sichuanicus Guo, Chen & Wang, 1978, China (Sichuan)

yesoensis (Heude, 1884), Japan (Hokkaido)

taiouanus Blyth, 1860, Taiwan (extinct in wild)

pseudaxis Eydoux & Souleyet or Gervais, 1841, Vietnam.

hortulorum Swinhoe 1864;

kopschi Swinhoe, 1874, southern China.

soloensis (Heude, 1894), Philippines (Sulu Is., feral ? extinct ?)

nippon Temminck, 1838, Japan (S. Honshu, Kyushu, Shikoku etc.).

aplodontus (Heude, 1884), Japan (N. Honshu)? doubtful.

keramae (Kuroda, 1924), Japan (Kerama Is.)

pulchellus Imaizumi, 1970, Japan (Tsushima Is.)

Cervus elaphus (Linnaeus 1756), Red deer (introduced to Morocco, USA, Argentina, Chile, Australia, New Zealand).

elaphus Linnaeus, 1758 (Sweden);

atlanticus Lönnerberg, 1906 (Norway);

hippelaphus Erxleben, 1777 (central Europe);

bolivari Cabrera, 1911 (northern Spain);

montanus Botezat, 1903 (Romania);

brauneri Charlemagne, 1920 (Caucasus, Europe, USSR);

scoticus (Britain);

corsicanus Erxleben, 1777, (Corsica

(reintroduced following extinction), Sardinia),

hispanicus Hilzheimer, 1909, (S. Spain);

maral Ogilby, 1840, (USSR, Iran, Turkey), **Maral**.

barbarus Bennett, 1833, (Algeria, Tunisia), **Barbary stag**.

Cervus elaphus (wallichi ssp. group)

bactrianus Lydekker, 1900, Tadzhikistan, Afghanistan, **Bactrian deer**.

yarkandensis Blanford, 1892, China (Sinkiang), **Yarkand stag**.

hanglu Wagner, 1844, Kashmir, **Hangul or Kashmir stag**.

wallichi Cuvier, 1823, China (Tibet, extinct ?), Nepal (extinct)

affinis Hodgson, 1841, China (Tibet), Bhutan, **Shou**.

macneilli Lydekker, 1909, China (Sichuan, Tibet); possible syn.

kansuensis Pocock, 1912, China (Gansu)

Cervus elaphus (canadensis ssp. group), **Wapiti, Elk, Maral** (introduced to New Zealand, USSR in Ural Mountains)

alashanicus Bobrinskii & Flerov, 1935, China (Inner Mongolia)

xanthopygus Milne-Edwards, 1867, USSR, China (Heilongjiang)

canadensis Erxleben, 1777;

manitobensis Millais, 1915;

merriami Nelson, 1902;

roosevelti Merriam, 1897;

nannodes Merriam, 1905;

nelson V. Bailey, 1935; Mexico (extinct), USA, Canada.

songaricus Severtzov, 1873; Tian Shan, China

sibiricus Severtzov, 1873; Russia, Mongolia, China (Sinkiang).

Elaphurus davidianus, Milu or Pere

Axis (Hyelaphus) calamianensis, Calamian deer

calamianensis (Heude, 1888), Philippines, Calamian Is.

Axis (Axis) axis, Chital or Indian spotted deer (introduced to Hawaiian Islands, New Guinea, Australia, Brazil, Argentina, Yugoslavia, USA, Andaman Islands)

axis (Erxleben, 1777), Sri Lanka, Bangladesh, India.

Cervus (Rusa) alfredi, Prince Alfred's or Philippine spotted deer

alfredi (Sclater, 1876), Philippines (Visayas Islands).

Cervus (Rusa) mariannus, Philippine deer *mariannus* Desmarest, 1822, Philippines (Luzon), Marianna; Islands (inc. Guam; feral); Caroline Islands (feral);

barandanus (Heude, 1888), Philippines (Mindoro);

nigricans Brooke, 1876, Philippines (Basilan, Mindanao);

nigellus (Hollister, 1913), Philippines (mountains of Mindanao);

boninensis Lydekker, 1905, Bonin I. (feral ?).

Cervus (Rusa) unicolor, Rusa, Sambar (introduced to Australia, New Zealand, USA)

unicolor Kerr, 1792, India, Sri Lanka;

ambojensis (Gray, 1861), Burma, Thailand, Cambodia, Laos, Vietnam, China (Yunnan, Guangxi).

dejeani (Pousargues, 1896), China (Sichuan, Guizhou, Hunan, Jiangxi)

equinus Cuvier, 1823, Indonesia (Sumatra), Malaysia (Malaya)

brookei Hose, 1893, Indonesia/Malaysia (Borneo)

hainana Xu, 1980, China (Hainan).

swinhoei (Sclater, 1862), Taiwan

Cervus (Rusa) timorensis, Rusa, Timor deer (introduced to Borneo - extinct ? - Amboina, Sulawesi, Mauritius, Anjouan in Comoro Is., Madagascar, Australia, New Caledonia, New Zealand).

rusqa Muller & Schlegel, 1845, Indonesia (Java)

renschii Sody, 1933, Indonesia (Bali) *floresiensis* (Heude, 1896), Indonesia (Lesser Sundas)

timorensis (de Blainville, 1822), Indonesia (Timor etc., feral ?)

macassaricus (Heude, 1896) Indonesia (Sulawesi, etc., feral ?).

djonga (Van Bemmelen, 1949), Indonesia (Muna Is., feral ?)

moluccensis Quoi and Gaimard, 1830, Indonesia (Sula' Is., Buru, Ceram etc., feral ?)

Cervus (Rucervus) duvauceli, Swamp deer (introduced to Texas in USA)

duvauceli Cuvier, 1823, India, Pakistan (extinct)

branderi Pocock, 1943, India

ranjitsinhi Groves, 1982, India, Bangladesh (extinct)

Cervus (Rucervus) schomburgki, Schomburgk's deer

schomburgki Blyth, 1863, Thailand (extinct)

Cervus (Rucervus) eldi, Thamin, Eld's deer

eldi M'Clelland, 1842, India (Manipur)

thamin (Thomas, 1918), Burma, Thailand

siamensis Lydekker, 1915, Thailand, Laos, Cambodia, Vietnam (extinct ?), China (Hainan)

Cervus (Przewalskium) albirostris, White-lipped or Thorold's deer

albirostris Przewalski, 1883, China (Tibet, Sichuan, Quinghai)

Odocoileus hemionus (columbianus ssp. group), **Black-tailed deer**

(introduced to Hawaiian Islands)
columbianus (Richardson, 1829); Pacific coast south of Skeena River in British Columbia south to just north of Los Angeles, California, USA.
sitkensis Merriam, 1898; Alaska panhandle down to Stikine River, British Columbia, Canada.

Odocoileus hemionus (hemionus ssp. group), **Mule deer** (introduced to Argentina)

hemionus (Rafinesque, 1817);
californicus (Caton, 1876);
fuliginatus (Cowan, 1933; *peninsulae* (Lydekker, 1898);
inyoensis Cowan, 1933 doubtful, may be hybrid of *hemionus* and *californicus*.
crooki (Mearns, 1897), Burro deer; taxonomic status uncertain.
eremicus (Mearns, 1897), Desert mule deer; taxonomic status uncertain. May be synonymous with *crooki*;
sheldoni Goldman, 1939, insular, Tiburon I., Mexico, doubtful, may be insular *eremicus*.
cerrosensis Merriam, 1898, insular, Cedros I., Mexico.

Rangifer tarandus (caribou ssp. group), **Woodland Caribou or Forest reindeer**

caribou (Gmelin, 1788), Alaska, Canada, USA.
terranovae (Bangs, 1896); Newfoundland, Canada;
osborni (J.A. Allen, 1902); British Columbia and southern Yukon Territory, Canada;
dawsoni (Thompson-Seton, 1900), insular, Graham I., Canada (extinct);
phylarchus (Hollister, 1912); Kamchatka, east Siberia, USSR.

Rangifer tarandus (tarandus ssp. group), **Reindeer, Barren-ground or Tundra caribou**

caboti (G.M. Allen 1914); Labrador caribou, Labrador, Canada.
tarandus (Linnaeus, 1758), Norway, Finland, USSR.
groenlandicus (Linnaeus, 1767), Canada, Greenland, Alaska.
fennicus (Lönnerberg, 1909), Finland, USSR.
valentinae (Flerov 1933); USSR
angustrostris (Flerov, 1932) USSR.

Rangifer tarandus (platyrhynchus ssp. group)

pearyi (J.A. Allen, 1902), Canada (Arctic Is. only), Greenland
eogroenlandicus (Degerbol, 1956), Greenland, extinct.
platyrhynchus (Vrolik, 1829), Svalbard.

Dama dama, **Fallow deer** (introduced to South Africa, Australia, Fiji Islands, USA, Argentina, Chile, Peru, Uruguay, Leeward Islands, most European countries)

dama (Linnaeus, 1758), natural distribution in historic times not defined, includes Turkey.
mesopotamica (Brooke, 1875), **Persian fallow deer**, Iran, Iraq (extinct ?), Jordan (extinct), Israel (extinct), Lebanon (extinct).

Axis (Hyelaphus) porcinus, **Hog deer** (introduced to Australia, Maryland in USA)

porcinus (Zimmermann, 1780), Pakistan, India, Nepal, Burma, Sri Lanka (feral ?).
annamiticus (Heude, 1888), Thailand, Cambodia, Laos, Vietnam, China (Yunnan).

Axis (Hyelaphus) kuhli, **Bawean deer**

kuhli (Muller and Schlegel, 1844), Indonesia, insular: Bawean.

Chile

Blastocerus dichotomus, Marsh deer
dichotomus (Illiger, 1811), Brazil,
Bolivia, Paraguay, Argentina,
Uruguay (extinct), Peru.

Ozotoceros bezoarticus, Pampas deer
bezoarticus (Linnaeus, 1758), Brazil,
Uruguay, Paraguay.
celer Cabrera, 1943, Argentina
leucogaster (Goldfuss, 1817), Brazil,
Bolivia, Paraguay, Uruguay,
Argentina.

Odocoileus virginianus (*cariacou* ssp.
group), Cariacú White-tailed deer

Mexico, Guatemala, Belize, Honduras, El
Salvador, Nicaragua, Costa Rica, Panama:
miquihuanensis Goldman and
Kellogg, 1940;
veraecrucis Goldman & Kellogg,
1940;
toltecus (Saussure, 1860);
mexicanus (Gmelin, 1788);
oaxacensis Goldman & Kellogg,
1940;
sinaloae J.A. Allen, 1903;
acapulcensis (Caton, 1877);
thomasi Merriam, 1898;
nelsoni Merriam, 1898;
yucatanensis (Hays, 1874);
nemoralis (Hamilton-Smith, 1827);
chiriquensis J.A. Allen, 1910;
rothschildi (Thomas, 1902) insular,
Coiba I., Panama.

Ecuador, Colombia, Venezuela, Guyana,
Surinam, Fr. Guiana, Brazil, Peru;
(Reddish Tropical Races).

tropicalis Cabrera, 1918;
gymnotis (Wiegmann, 1833);
curassavicus Hummelinck, 1940,
insular, Curaçao;
margaritae (Osgood, 1910), insular,

Margarita I., Venezuela; *cariacou*
(Boddaert, 1784).

Ecuador, Colombia, Venezuela, Peru;
(Grey Highland Races).

goudotii (Gay & Gervais, 1846);
lasiotis Osgood, 1914;
ustus (Trouessart, 1910);
peruvianus (Gray, 1874).

Odocoileus virginianus (*virginianus* ssp.
group), White-tailed deer

Mexico, United States; (Transitional
Races).

couesi (Coues & Yarrow, 1875);
carminis Goldman & Kellogg, 1940.

USA, Canada, Mexico (typical subspecies):

virginianus (Zimmermann, 1780);
borealis (Miller, 1900);
dacotensis Goldman & Kellogg,
1940;
ochrourus Bailey, 1932;
leucurus (Douglas, 1829);
texanus (Mearns, 1898);
macrourus (Rafinesque, 1817);
mcilhennyi F.W. Miller, 1928;
osceola (Bangs, 1896);
seminolus Goldman & Kellogg,
1940;
taurinsulae Goldman & Kellogg,
1940);
venatorius Goldman & Kellogg,
1940;
hiltonensis Goldman & Kellogg,
1940;
nigribarbis Goldman & Kellogg,
1940;
taurinsulae, *venatorius*, *hiltonensis*,
nigribarbis all insular, off Georgia &
S. Carolina;
clavium (Barbour and Allen 1922),
insular, Florida Keys.

shirasi Nelson 1914;
gigas Miller, 1899;

USSR, Mongolia, China:

buturlini Chernyavsky & Zheleznov,
1982;
pfizenmayeri Zukowsky, 1920;
cameloides Milne-Edwards, 1867,
(Manchuria), eastern Mongolia.

Mazama gouazoubira Gray (or brown)
brocket

**Ecuador, Colombia, Venezuela, Trinidad,
Guyana, Surinam, Fr. Guiana, Brazil,
Argentina, Uruguay, Peru, Bolivia:**

gouazoubira (Fischer, 1814);
argentina Lonnberg, 1919;
cita Osgood, 1912;
mexiana (Hagmann, 1908), insular,
Mexiana Island, Amazon Delta,
Brazil;
murelia J.A. Allen, 1905;
nemorivaga (F. Cuvier, 1817);
permira Kellogg, 1946, INSULAR,
San Jose I., Panama, this sp. ?;
sanctaemartae J.A. Allen, 1915;
Santa Marta, Columbia.
tschudii (Wagner, 1855); Peru.

Mazama americana (*americana* ssp. group),
Red brocket

Ecuador, Trinidad:

americana (Erxleben, 1777);
carrikeri Hershkovitz, 1959; Sierra
De Santa Marta, Columbia.
gualea J.A. Allen, 1915;
trinitatis J.A. Allen 1915 (insular,
Trinidad);
zamora J.A. Allen, 1915;

**Ecuador, Colombia, Venezuela, Trinidad,
Guyana, Surinam, Fr. Guiana, Brazil,
Argentina, Bolivia, Paraguay, Peru:**

jucunda Thomas, 1913;
sheila Thomas, 1913;

zetta Thomas, 1913;
rosii Lönnberg, 1919;
toba Lönnberg, 1919;
sarae Thomas, 1925;
superciliaris (Gray, 1850);
whitelyi Gray, 1873;

Mazama americana (*temama* ssp. group),
Red brocket

temama (Kerr, 1792);
cerasina Hollister, 1914; Guatemala.
pandora Merriam, 1902; Yucatan,
Mexico.
repericia Goldman, 1913.
From Yucatan south into central and
south America: Mexico, Guatemala,
Belize, Honduras, El Salvador,
Nicaragua, Costa Rica, Panama.

Mazama nana

nana (Hensel, 1872). Brazil,
Argentina, Paraguay, Bolivia ?

Mazama rufina

rufina (Bourcier & Pucheran, 1852),
Ecuador
bricenii Thomas, 1898, Venezuela

Mazama chunyi

chunyi Hershkovitz, 1959, Peru,
Bolivia.

Pudu puda, Southern Pudu

puda (Molina, 1782), Chile,
Argentina

Pudu mephistopheles, Northern Pudu

mephistopheles De Winton, 1896,
Colombia, Ecuador, Peru

Hippocamelus antisensis, Taruca

antisensis (D'Orbigny, 1834),
Ecuador, Peru, Bolivia, Argentina

Hippocamelus bisulcus, Huemul

bisulcus (Molina, 1882), Argentina,

Muntiacus atherodes, Bornean yellow muntjac

atherodes Groves & Grubb, 1982, Indonesia/Malaysia (Borneo)

Muntiacus reevesi, Reeves muntjac (Introduced to Britain, France)

reevesi (Ogilby, 1839), China (in SE)

micrurus (Sclater, 1875), Taiwan

Muntiacus feai, Fea's muntjac

feai (Thomas & Doria, 1889), Burma, Thailand, China

rooseveltorum Osgood, 1932, Laos, China? based on one specimen.

Muntiacus sp. nov., Gongshan muntjac

sp. nov., China (Yunnan, Tibet), Burma

Muntiacus crinifrons, Black muntjac

crinifrons (Sclater, 1885), China (Zhejiang, Anhui)

Muntiacus muntjak (*muntjak* ssp. group, Red muntjac)

muntjak (Zimmermann, 1780) Indonesia/Malaysia (Malaya, Sumatra, Java, Borneo, Bali, Lombok, etc.)

montanus Robinson and Kloss, 1918, Indonesia (Sumatran highlands)

Muntiacus muntjak (*vaginalis* ssp. group), Indian muntjac

vaginalis Boddaert, 1785, India, Nepal, Burma

aureus (Hamilton Smith, 1826), India, Burma, Pakistan

malabaricus Lydekker, 1915, India, Sri Lanka

curvostylis (Gray, 1872), Burma, Thailand

(*anamensis* Kloss, 1928, Vietnam, Laos, Thailand ? Cambodia ? doubtful)

(*menglalis* Wang & Groves, 1988, China (Yunnan), Burma, Laos, Vietnam)? doubtful

(*yunnanensis* Ma & Wang, 1988, China (Yunnan, Sichuan), Vietnam)? doubtful

nigripes G.A. Allen, 1930, China (Hainan)

Capreolus capreolus, Roe deer

capreolus (Linnaeus, 1758), Europe excluding Mediterranean Islands, USSR, Turkey, Iran, Iraq, Lebanon (extinct), Israel (extinct), Syria. No ssp. except perhaps *coxi* Cheesman & Hinton, 1923, Iraq.

** population from southern Spain probably a separate subspecies.

Capreolus pygargus, Siberian roe

pygargus (Pallas, 1771) syn.

caucasica Dinnik, 1910, USSR.

tianschanicus Satunin, 1906, USSR, Mongolia, China (Sinkiang) *bedfordi* Thomas, 1908,

melanotis Miller, 1911, USSR, China (Gansu, Shanxi, Heilongjiang), Korea

Capreolus pygargus melanotis, Tibetan roe deer (Miller, 1911)

Alces alces, Moose

European

alces (Linnaeus, 1758) *alces* Norway, Sweden, Finland, Poland, USSR, China (Sinkiang), North Mongolian specimen have pelage markings similar to American forms, but antlers more similar to West-Siberian moose;

caucasica Vereschagin, 1955, USSR (Caucasus), extinct).

Alaska, Canada, contiguous USA;

americana, (Clinton, 1822) syn.

andersoni Peterson, 1950;

David's deer

dauricus Milne-Edwards, 1866,
China (extinct in wild).

South America: Status Report and Recommended Conservation Action
 Dietland Muller-Schwarze and Don Moore

STATUS OF SOUTH AMERICAN CERVIDS
 (Guatemala to the Straits of Magellan)

<u>SPECIES</u>	<u>STATUS</u>
<i>Mazama gouzoubira</i> (<i>gouzoubira, argentina, cita, mexicana, murelia, nemorivaga, permira, sanciaemarie, tschudii</i>)	Unknown
<i>Mazama americana</i> (<i>americana, carrikeri, gualea, trinitatis, zamora, jucunda, sheila, zetta, rosii, toba, sarae, superciliaris, whitelyi</i>)	Unknown
<i>Mazama nana</i>	Unknown
<i>Mazama rufina rufina</i>	Vulnerable
<i>Mazama rufina bricenii</i>	Unknown
<i>Mazama chunyi</i>	Unknown
<i>Pudu pudu</i>	Vulnerable
<i>Pudu mephistopheles</i>	Unknown
<i>Hippocamelus antisensis</i>	Unknown
<i>Hippocamelus bisulcus</i>	Endangered
<i>Blastocerus dichotomus</i>	Vulnerable
<i>Ozotoceros bezoarticus</i> (<i>bezoarticus, leucogaster</i>)	Endangered
<i>Ozotoceros bezoarticus celer</i>	Critical
<i>Odocoileus virginianus</i> (<i>tropicalis, gymnotis, curassavicus, margaritae, cariacou, goudotii, lasiotis, peruvianus, ustus</i>)	Unknown
Total of 12 species, 36 subspecies (1-critical; 3-endangered; 3-vulnerable; 0-safe; 37-unknown).	
Total of ____ countries contain threatened species (LIST COUNTRIES & SPECIES)	

Synopsis

Available Information. From certain regions and for some species the Deer Specialist Group has obtained sufficient information to enable the development of recommendations for immediate management and conservation actions. However, the status of a number of taxa in large geographic areas remains insufficiently known at this time. Data are lacking especially from Central America and northern South America. All readers of this Action Plan are encouraged to provide information to complete this process, and any assistance would be greatly appreciated.

Species Summary. The South American megafauna, especially in more open habitats, has been critically depleted. Pessimistic forecasts have predicted the demise of several threatened species. With reference to the pampas deer (*Ozotocerus bezoarticus*) and the huemul (*Hippocamelus bisulcus*), Spotorno et al. (1987) stated that: "We probably will never fully understand the biology of these vanishing gracile animals". One **critically endangered** (Pampas deer, *O. b. celer*) and three **endangered** forms (Pampas deer, *O.b.bezoarticus* and *O.b. leucogaster*, and huemul (or Southern Andean deer) are found in South America. Once the various subspecies of the white-tailed deer (*Odocoileus virginianus*) and species of the brockets (*Mazama* spp.) are better known, more taxa will almost certainly be added to the list. The most important populations of the marsh deer, *Blastoceros dichotomus*, in the Pantanal of Brazil are of particular concern because of the current onslaught of a gold rush by hundreds of thousands of miners and the concomitant mercury pollution of waterways. This problem seriously exacerbates the existing threats posed by soy farming and disease transmission from cattle.

Priorities by country.

Argentina. Of the countries with sufficient information, Argentina has the lowest numbers of deer and the remnant populations are fragmented. This "biogeographical debris" (Janzen, 1989?) has attracted the attention of national biologists and international organizations. Efforts to stem and reverse the tide of encroachment by livestock into deer habitat are underway, but additional funding is required.

Brazil. Both pampas and marsh deer are under considerable pressure, the latter particularly by the recent upsurge in gold mining in the Pantanal.

Chile. The most threatened species are the huemul in the south and possibly the taruca (northern huemul, *Hippocamelus antisensis*) in the north. Livestock grazing is the greatest problem. Huemul habitat has been either completely lost by being fenced off for cattle, or grazing cattle wander onto the remaining slopes still available to the huemul. Extensive fires for clearing land have destroyed vast tracts of montane forests (*Nothofagus* spp.). Such habitat is now being reclaimed and replanted. In the south, large reserves and national parks have been designated, but protective measures have not yet been implemented. The southern pudu, *Pudu puda*, has suffered from loss of habitat to livestock ranching and logging, and in part of its range exotic deer, such as *Cervus elaphus*, are destroying its quila (*Chusquea* spp.) understory habitat. Captive breeding for release into three national parks in the Andes is taking place at present.

Uruguay. The marsh deer is almost certainly extinct in Uruguay. Pampas deer (*O.b. bezoarticus*) survive in several isolated small populations on privately owned, pastures, though no reserves exist. Competition with sheep is a major threat. Conservation in the context of private ownership of land and wildlife needs to be defined.

In all other countries the status of virtually all native deer needs to be determined. This task is challenging because the less known species and subspecies live in (often dense) forests, and there are few resources and trained wildlife biologists, managers, or rangers.

NOTE: MAYBE INCLUDE A DOLLAR AMOUNT FOR CONSERVATION ACTION.

I) Cervids of conservation concern

MARSH DEER, (*Blastocerus dichotomus*)["Ciervo de los Pantanos" (Arg., Uruguay), "Guazu-Pucu"(Arg.), "Ciervo colorado"(Uruguay), "Cervo" (Bra.), "Cervo-do-pantanal"(Bra.)]

Mace-Lande Red Data Categorization: VULNERABLE.

Distribution: See map #1. Occurs in insular populations throughout remnants of its former range in central South America. Remaining populations are found in or near swampy habitat in northeastern Argentina, eastern Bolivia, Brazil south of the Amazon forest, Paraguay, southeastern Perú at Pampas del Heath near Bolivia (Hofmann et al. 1976, Gardner pers. comm.). Almost certainly extinct in Uruguay (Verdier, pers. comm. 1991).

Past Distribution: Original range was marshes and wet savannahs throughout northeastern Argentina, the southern half of Brazil, Bolivia, southeastern Perú, Paraguay, and Uruguay (Nowak & Paradiso 1983).

Population Data:

A. Status in Wild: Total numbers remain unknown, but the species is listed as endangered by USDI and is on Appendix I of CITES (Thornback & Jenkins 1982, Nowak & Paradiso 1983).

B. Estimated numbers in wild:

Total: Fewer than 10,000.

Argentina. Found mainly in the northeast provinces from 50-80 m above sea level; the species is widespread at low density. No numerical estimates are available, although "fair numbers" were thought to exist in the 1970's (Thornback & Jenkins 1982); the population trend for 1990 in the Ibera Natural Preserve, Corrientes Province was thought to be "stable" (Beccaceci, pers. comm.). We estimate Argentina's total current population at fewer than 1,500 animals.

Brazil. Restricted in distribution and at low density in the Pantanal, "decreasing" (Pinder, pers. comm.); an aerial survey of the Pantanal in 1977 resulted in an estimate of 5-6,000 individuals, or possibly even 7,000 deer (Schaller & Vasconcelos 1978). Pinder (pers. comm.) also notes there is a relic population (4-8 animals) in the State of Rio Grande do Sul, and feels the trend is "decreasing"; 8-12 exist on the Caiman Ranch, Miranda, MS (Panatanal), where the trend is "stable"; 30-50 are estimated in the State of São Paulo, and the trend is "decreasing". Based on this information, we estimate current numbers in all of Brazil at 7,000-8,000 animals.

Paraguay. Restricted and at low density (Sosa Yubero pers. comm.).

Peru. Occurred at Pampas del Heath at an estimated density of 1 animal/140-200 ha.; this area comprises 6,000 ha., which gave a total estimate for the habitat of 30-40 animals (Hofmann et al. 1976). Current numbers are unknown.

Uruguay. This deer possibly still existed as late as 1981 in Uruguay's Depto. Rocha (Bañado de Santa Terésa) (Thornback & Jenkins 1982), but large swamp areas were seen to be drained in 1982 (Muller-Schwarze, pers. obs.), and the deer is now probably extinct in this country (Verdier pers. comm.).

C. Status in captivity:

5.5 in 3 collections are listed in the 1987 Census of Rare Animals in Captivity (Olney et al.,

1989). 1.1 are listed in the International Species Information System's Mammal Abstract for 31 December 1990 (ISIS 1990).

Ecology and Reproduction:

A. Habitat and Food Preference: Prefers marshes and wet savannahs with 30-60 cm deep standing water and nearby cover. Its home range boundaries change with water level, so it also uses seasonally flooded areas. High grass or damp forest edge is used as cover, but it avoids dense forest. It remains in seclusion during daylight hours, and feeds in clearings at night and during dusk and dawn. The diet is grasses, reeds and aquatic plants, but it may rely on leaves of shrubs and vines during prolonged flooding. The species is a grazer-browser. (Thornback & Jenkins 1982, Nowak & Paradiso 1983, all reporters pers. comm.)

B. Average group size and dispersion pattern: *Blastocerus* lives alone or in groups of up to six individuals; groups may be mixed or single-sexed.

C. Movements: When lowlands are flooded during the wet season, marsh deer are forced to live on limited areas of high ground with domestic livestock; there is resultant competition between the deer and the livestock, persecution of the deer by stockmen, and possibly transmission of disease from cattle to deer (Nowak & Paradiso 1983).

D. Time of calving: A single offspring is born during the fawning season from May-September after a nine-month gestation period (Nowak & Paradiso 1983).

E. Age at first reproduction:

Causes of Decline:

a) *Argentina.* Cattle diseases including foot & mouth, brucellosis, piroplasmiasis, tuberculosis; poaching for trophies and gaucho clothing (Beccaceci pers. comm.). Also, habitat loss in Buenos Aires province (Thornback & Jenkins 1982).

b) *Brazil.* Cattle diseases are the main threat in the Pantanal (Schaller & Vasconcelos 1978, Thornback & Jenkins 1982, Pinder pers. comm.). Both Brucellosis and foot-and-mouth disease may limit population growth (Schaller & Vasconcelos 1978). In other areas of the country, poaching by landless people and habitat loss due to marsh drainage for agricultural development contribute to the continued decline of remaining populations (Thornback & Jenkins 1982, Pinder pers. comm.).

c) *Paraguay.* Habitat destruction, hunting pressure and cattle diseases. Presently, the area where the majority of the Paraguayan population occurs is on the verge of being eliminated due to the hydroelectric project Yacyreta (Sosa Yubero pers. comm.).

d) *Uruguay.* Habitat loss due to drainage of the wetlands in Rocha and Treinta Y Tres, and to fire in the bañados (Müller-Schwarze, pers. obs.). Predation by humans was also a major factor in this extinction (Verdier, pers. comm.).

Native Subsistence Use: Hides with hair intact are still a popular work-cloth among gauchos in Argentina (Beccaceci pers. comm.).

Commercial Uses: Sale of the antlers (and antlered heads?) as trophies (Beccaceci pers. comm.).

Protected areas:

Argentina. Ibera Natural Preserve, Corrientes Province ("commonly seen"); Parque Nacional Rio Pilcomayo, Formosa Province ("occasionally seen") (Beccaceci, pers. comm.). There is no management plan. Protection is not considered adequate due to lack of funds for ranger patrols, hunting on private properties that are part of the reserve, and small areas of protected public land (Beccaceci).

Brazil. Emas National Park ("rarely seen"). A management plan exists, but it does not provide specifically for the species. Protection is not adequate due to a staff of only four individuals, insufficient

fuel for vehicular patrols, inaccessibility of remote parts of the park, and threats of encroachment into the park by neighboring soy farmers. Araguaia National Park (status "unknown"). No management plan exists. Protection in this national park is inadequate because there is a federal road that crosses the park, which allowed many squatters to settle in the area. Also, Indians are allowed to live (and, presumably, hunt) inside the park. Caracara, Guapore and Jaru reserves are also believed to contain the species, but numbers there are unknown; in general, there is no protection against poaching in these reserves (Pinder, pers. comm.).

Paraguay. It is occasionally seen in P.N. Tinfunke, but protection is not considered adequate due to encroachment by local private landholders (Sosa Yubero pers. comm.).

Uruguay. Probably extinct (Verdier pers. comm.).

Occurrence outside existing protected areas:

Argentina. Provinces of Buenos Aires, Entre Rios, Santa Fe, Salta, Chaco, and areas of Corrientes (Beccaceci, rep.).

Brazil. Marsh deer are found in the Pantanal, Araguaia and Xingu basins. A small population occurs in disturbed habitats close to the city of Porto Alegre (Pinder, pers. comm.).

Uruguay. Probably extinct (Verdier, pers. comm.).

Conservation Action: (Recommended)

1) **Surveys needed.** An accurate census of Blastocerus in captivity is needed; results should be entered into the International Species Information System. A larger captive population is probably needed. A census of marsh deer in the wild is needed.

2) **Create protected areas.** More and/or well-protected reserves are needed. Reserves should be **cattle-free** inside their borders. Gold mining and soy farming currently encroach upon the Pantanal in Brazil.

3) **Public education.** A public educational campaign should discourage the use of the species' fur and meat until population size and stability are well-documented.

4) **Law enforcement.** Trophy hunting should be strictly controlled. **EXPAND**

5) **Policy development.** Habitat protection and harvest controls should be legislated and enforced. Human encroachment must be controlled in core reserves and buffer zones; development policies can address this problem (roads create problems of squatters, gold miners and subsequent mercury poisoning of stream systems, etc.).

6) **Increase knowledge of life history.** Behavioral, ecological and disease studies of the species are necessary so that proper management can occur.

7) **Develop ecotourism.** Ecotourism by cattle ranchers and other private landowners may be desirable. Note that this species occurs in the habitat where Maguari storks and other charismatic wading birds live and nest.

8) **Uruguay.** If habitat becomes available, and can be protected, reintroductions from appropriate, nearby areas should be considered.

Field studies:

a) Marsh deer in the Ibera Natural Reserve. Investigator: Marcelo D. Beccaceci

b) El ciervo de los Pantanos en el Paraguay. Informe Cientifico, I.C.B., Universidad Nacional, Asuncion, Paraguay.

c) Estudio de la Fauna Silvestre en el area del embalse de la represa de Yacyreta. Wilfrido Sosa Yubero.

Reporters

Argentina: Marcelo D. Beccaceci, Boedo 90 Florida (1602), Buenos Aires, ARG. Ph: 01-797-2251.

Brazil: Laurenz Pinder, 118 Newins-Ziegler Hall, University of Florida, Gainesville, FL. 32611-0304 Ph:904-392-4851.

Paraguay: Wilfrido Sosa Yubero, Centro de Datos para la Conservacion, 25 de Mayo, Edif. 640 Piso 12B, C.C. 3303. Asuncion, Paraguay.

Uruguay: Lic. Ignacio Verdier, Secc. Etologia, Facultad de Ciencias, Tristan Narvaja 1674, 11200 Montevideo, Uruguay Ph:419087-89, FAX 5992-409049

TARUCA, (*Hippocamelus antisensis*), North Andean deer.

Mace-Lande Red Data Categorization: INDETERMINATE.

Distribution: See map #2a. From about 8° South in Peru to about 28° South in Argentina (Merkt, 1987), in the high Andes from about 3000 meters (Franzmann, pers. comm.) to over 5400 meters (Merkt, 1987), or above treeline.

Past Distribution: *H. antisensis* original range was the Andes of Ecuador, Peru, western Bolivia, northeastern Chile and northwestern Argentina (Nowak & Paradiso, 1983).

Population Data:

A. Status in Wild: On Appendix I of CITES, and listed as Endangered by USDI (Nowak & Paradiso, 1983). Widely but sparsely distributed in the northern Andes, but numbers unknown (Thornback & Jenkins 1982); "fair numbers of the northern species seen at higher altitudes" (Franzmann, pers. comm. 1991) conflicts with Thornback & Jenkins (1982) assessment that only scattered populations with declining numbers remain within the original range. It may be declining due to competition with domestic stock, habitat destruction and hunting, but protection of the vicuña (*Vicugna vicugna*) in national parks appears to directly benefit the species (Thornback & Jenkins 1982).

Chile. Conservation status in Chile is Vulnerable, but likely to move into the Endangered category if causal factors of habitat destruction and/or environmental deterioration continue to operate (Glade, 1987).

B. Estimated numbers in wild: Unknown.

C. Status in captivity:

Not listed by Olney et al. (1989) or ISIS (1990).

Ecology and Reproduction:

A. Habitat and Food Preference:

B. Average group size and dispersion pattern:

C. Movements:

D. Time of Calving:

E. Age at first reproduction:

Causes of Decline: Habitat destruction and decline due to agriculture, increased competition from domestic livestock, and hunting (Miller et al., 1973, Thornback & Jenkins, 1982). In Chile, destruction of cover by charcoal makers burners is an important cause of decline, while competition from domestic livestock and conversion of riparian habitat to agriculture are also a threat (Miller et al., 1973).

Native Subsistence Use: Apparently easily hunted and killed by Indians for meat (Thornback & Jenkins, 1982).

Commercial Uses:

Protected areas:

Occurrence outside existing protected areas:

Conservation Action: (Recommended)

1) Reduce human/wildlife conflict. Address problem of taruca foraging in alfalfa fields

(compensate farmers, build fence to exclude taruca) (Carrasco pers. comm.).

2) **Create protected areas.** Create parks and reserves to protect riparian and other habitat from development, and to provide for the biological needs of taruca.

Reduce competition by livestock; e.g. provide fence to prevent incursion by cattle onto habitat necessary for taruca.

Field studies:

Reporters:

HUEMUL, (*Hippocamelus bisulcus*), the South Andean deer, southern huemul, huemul chileno (Stutzin pers. comm.), yakchal (Alacalufe).

Mace-Lande Red Data Categorization: ENDANGERED.

Distribution: See Map _____. Isolated small populations exist from Mendoza Argentina to the Straits of Magellan below the treeline (to 3,000 meters) (Serret, 1990); in Chile from latitudinal 34° south (Rancagua) to 40° south (Stutzin, pers. comm.). Found from 300-2000 meters altitude in Argentina (Ramilo, pers. comm.).

Past Distribution: In contrast to the taruca, the southern species (*H. bisulcus*) was originally found in the Andes of central and southern Chile and Argentina (Nowak & Paradiso, 1983).

Population Data:

A. Status in Wild: Listed in Appendix I of CITES, protected by law in both Chile and Argentina, but enforcement outside of national parks is very difficult (Thornback & Jenkins, 1982). Listed as Endangered by USDI/FWS (50 CFR 17.11 & 17.12, April 15, 1990). Endangered according to the Red List of Chilean vertebrates (Stutzin, pers. comm.). The deer's range has been reduced at least 50% due to colonization and habitat modification in the foothills, including forestry and replacement of native trees with exotics (Serret 1990). Subsistence hunting, domestic livestock and disease transmission, and competition with introduced deer (*Cervus elaphus*, *Dama dama*, *Axis axis*) have also contributed to the decline of this species throughout its range (Serret, 1990, Ramilo, pers. comm.).

Argentina. Known populations in Argentina are: southern part of Nahuel National Park (Rio Negro Prov.); Lago Puelo N.P. (Chubut Prov.); Lakes La Plata and Fontana (Chubut Province); Perito Moreno N.P. (Santa Cruz Prov.); Lake San Martin and Laguna del Desierto (Santa Cruz Prov.) (Ramilo, pers. comm.). Serret (pers. comm.) indicates huemuls are seen (rarely) in P.N. Nahuel Huapi (Neuquen and Rio Negro Provinces); this conflicts with Thornback & Jenkins (1982, pg. 477). Serret (pers. comm. 1991) also provided the following distributional listing of the huemul in Argentina: P.N. Nahuel Huapi (Nequen and Rio Negro); Cerro Ventisquero (Rio Negro); P.N. Lago Puelo, P.N. Los Alerces (Chubut); Lago Epuyen, Lago Esperanza, Lago Gral Vintter, Lago Huemules, Lago La Plata (Provincial Reserve Project in Chubut), Lago Pico No.5 (Chubut); Laguna Baguilt, Laguna Greda (Chubut); Cerro Botella, Cerro Dos Picos, Cerro Tres Picos, Cerro Plataforma (Chubut); Rincon Aceite (Chubut); Rio Grande, Rio Tigre (Chubut); P.N. Los Glaciares, P.N. Perito Moreno (Santa Cruz); Lago San Martin, Laguna del Desierto (Santa Cruz); Rio Carrera (Provincial reserve project) (Santa Cruz).

Chile. Current conservation status in Chile is Endangered (Glade, 1987).

B. Estimated numbers in wild:

Total: About 2,000.(REF.)

Argentina. Scattered, insular populations; still considered less threatened than the Chilean populations (>1,000 animals) in 1982 (Thornback & Jenkins, 1982). Definitely recorded from Santa Cruz and Chubut Provinces (Thornback & Jenkins, 1982). Proyecto Huemul, begun in 1986 under the auspices of the Fundacion Vida Silvestre Argentina (Argentinean Wildlife Foundation), resulted in a good estimate for Perito Moreno N.P., Santa Cruz Province, of 20 huemul minimally on 3,000 hectares (Serret 1990); 50% of the park's 115,000 hectares is considered viable huemul habitat, so an extrapolation is a minimum of 400 deer over the 60,000 hectares. However, Ramilo (pers. comm.) and Serret (pers. comm.) estimate the park's population at only 100 animals and possibly stable.

Chile. Currently restricted in distribution and at low density in Chile. Fewer than 1000 were believed to exist in the provinces of Aysen and Magallanes about a decade ago (Thornback & Jenkins, 1982). about 50 animals and decreasing in Region X; under 1000 animals and decreasing in Regions X-XII (Stutzin pers. comm.). Only 8-15 on Cerro de los Huemules at Rio Claro/ Rio Simpson reserve, 26 adults and 6 fawns on Cerro Tamango at Lago Cochrane reserve (C. Godoy, pers. comm.)

CLARIFY REGIONS "X"

C. Status in captivity:

Not listed by Olney et al. (1989) or ISIS (1990). In 1981 there were six animals in a private zoo in Chile (Thornback & Jenkins, 1982). In 1990 there were no captive individuals in Argentina (Serret, pers. comm.) or Chile (Stutzin, pers. comm.).

Ecology and reproduction:

A. *Habitat and Food Preferences:* The species lives in the subantarctic forests of Argentina and Chile, from the thick lake-level vegetation to the treeline. In Chile, it may be found above the treeline as well (Povilitis, 1978). The species prefers a wooded habitat of *Nothofagus* and *Chusquea* species (Povilitis, 1978). It currently seeks rocky cliff areas with good tree and shrub coverage (Serret, pers. comm.), and evidence suggests it has always inhabited these areas (Povilitis, 1978). Huemul move from tall forests in the dry summer months to low areas in the winter; these different habitats give protection against extremes of weather during summer and winter months, and they and connecting corridors may be essential for huemul survival (Thornback and Jenkins, 1982).

Huemul prefer lenga (*Nothofagus pumilio*), chaura (*Pernettya mucronata*), murtilla (*Empetrum rubrum*), cadillo (*Acaena ovalifolia*), Valeriana (*Valeriana* sp), and the diet includes numerous herbaceous and shrubby plants (Serret, pers. comm.).

B. *Average group size and dispersion pattern:* Group size in Argentina's P.N. Perito Moreno varies from 1 to 3 individuals: solitary males and females, male and female pairs, female with offspring, or a male with a female and her offspring (Serret, pers. comm.). Male-female associations in general are more common for the huemul than for most other deer (Thornback & Jenkins, 1982).

C. Movements:

D. Time of Calving:

E. Age at first reproduction:

Causes of Decline:

The main cause of population decline in Argentina is related to the presence of livestock in the huemul's range. The main consequences of the presence of livestock are: significant habitat modification affecting forest regeneration in particular; low altitude valleys formerly used by huemul during winter are now fenced off for cattle, causing huemul to stay in higher zones and suffer rigorous winter conditions, lower year-round plant production and possibly higher mortality. Predation by domestic dogs used for livestock management, and foot-and-mouth disease are other causes of mortality. Poaching by man is a concern. Competition by introduced herbivores, especially red deer (*Cervus elaphus*) and fallow deer (*Dama dama*) also contributes to the decline (Ramilo, pers. comm., Serret, pers. comm.).

Some of the rural settlers living in huemul habitat occasionally hunt the species, or act as guides for illegal hunters (Ramilo, pers. comm.).

Although the huemul was historically hunted with dogs and men with firearms, it is now endangered by habitat modification including forest fires, overgrazing near forest lands and subsequent loss of *Nothofagus dombeyi*, overharvesting of the native forest, and replacement of the native forests with exotic tree species (Serret, pers. comm.).

In Chile, the main causes of population decline are: habitat destruction by deforestation; illegal hunting; parasites and infections transmitted by domestic animals, especially livestock (cattle, sheep and goats) (Stutzin, pers. comm.). Habitat changes, caused by fire to improve accessibility for domestic stock or for colonization, have led to soil erosion and a more arid environment, and pose a serious threat to huemul survival (Thornback & Jenkins, 1982). Logging and other unregulated human use of forests are also threats (Povilitis, 1978). Habitat destruction is apparently particularly significant in the lower, more vulnerable wintering areas (Thornback & Jenkins, 1982). Although the huemul is protected by law, enforcement is virtually impossible in the isolated areas where it occurs, and poaching continues (Stutzin, pers. comm.). Livestock may alter vegetation and soils, retard recovery of vegetation, and displace huemuls from preferred sites (Povilitis, 1978; Thornback & Jenkins, 1982). Additionally, huemul are susceptible to foot-and-mouth disease, cysticercosis, coccidiosis and internal parasites transmitted by domestic animals, and these have been important factors in the decline of huemul in Chile (Thornback & Jenkins, 1982). Finally, competition with introduced red deer (*Cervus elaphus*) may be a factor in the Huemul's disappearance from lower elevations (Thornback & Jenkins, 1982).

Native Subsistence Use:

Commercial Uses:

Protected areas:

Argentina. P.N. Perito Moreno, about 100 individuals are occasionally seen, and protection is considered adequate; there is no management plan (Serret and Ramilo, pers. comm.). In P.N. Nahuel Huapi it is rarely seen, and there is no management plan; 13% of the protected area is private land, and as settlers have livestock and dogs, protection is considered inadequate (Ramilo, pers. comm.). In P.N. Lago Puelo it is rarely seen, and protection is not adequate due to settlers and dogs, the small size of the park, and the absence of a management plan. In P.N. Los Alerces it is occasionally seen, protection seems adequate, and there is no management plan. In P.N. Los Glaciares it is rarely seen, protection is inadequate due to settlers with livestock and dogs, and intense tourist use of some park areas; there is no management plan (Ramilo, pers. comm.). A group of 13 animals is estimated to live at the Rio Carrera Provincial Park (Serret, pers. comm.).

Chile. In Nuble, Rio Simpson and Cerro Tamango nature reserves, where the deer are "rarely seen", protection is considered adequate (Stutzin, pers. comm.); management plans exist for Rio Simpson and Cerro Tamango (Muller-Schwarze, pers. obs.). In B.O. Higgins National Park, which is a remote and very large national park, inadequate staffing results in inadequate protection and no management plan (Stutzin, pers. comm.).

Occurrence outside existing protected areas

Argentina. Lakes Fontana and La Plata in Chubut Province, and Lake San Martin and Laguna del Desierto in Santa Cruz Province have "populations of some importance"; populations are scattered and isolated, sometimes separated by many kilometers (Ramilo, pers. comm.).

Chile. Small populations occur in Nuble near the nature reserve; small populations in Region X (Chiloe continental) Aysen areas, near the coast and possibly on islands of Region XI (Aysen) (Stutzin, pers. comm.).

Conservation Action: (Recommended)

1) **Create protected areas.** Creation of new protected areas, controlling cattle and deer (*Cervus elaphus*) are necessary to prevent further habitat destruction and population decline (Ramilo, pers. comm., Stutzin, pers. comm.). To re-establish huemul in formerly occupied high altitudinal ranges livestock must be restricted to pastures in lower elevations; this will necessitate the purchase

and restoration of grazing lands.

The huemul's montane habitats constitute the watersheds which are critical for providing clean drinking water for humans.

To allow recovery of the species in Chile, CONAF managers are replanting *Nothofagus pumilio*, removing livestock from lower slopes, and are purchasing former livestock grazing lands to enlarge the Rio Simpson reserve (Muller-Schwarze, pers. obs.).

2) **Surveys needed.** A complete census of existing populations, and the creation of bi-national preserves and conservation strategies on the Argentinian-Chilean border are strongly needed (Serret, pers. comm.). Proyecto Huemul biologists are trying to determine population levels and demographic characteristics of Argentinian populations, in order to determine conservation problems facing insular populations (de Chiesa, 1988).

3) **Law enforcement.** Prevent further illegal hunting (Stutzin, pers. comm.).

4) **Seek funding.** Financial support for conservation from bi-lateral and multi-lateral development banks may assist in the development and implementation of this conservation action plan.

The following conservation measures were proposed a decade ago (Thornback & Jenkins, 1982): identification of surviving huemul populations of significant size, evaluation of their habitat requirements and development of administrative programs to protect the survivors; establishment of Huemul/Ecosystem reserves along southern, central and northern portions of the huemul's former range; creation of national and regional huemul conservation teams and locally involved groups; implementation of a Huemul Recovery Team to help implement these measures. The areas where huemul can survive as self-sustaining populations must be free from illegal hunting, uncontrolled fire, over-exploitation of rangelands and vegetation, and hazards posed by domestic animals; they must be large and different enough in habitat to support a large, self-sustaining population in order to minimize the chance of extinction due to random events or natural catastrophe, and to allow free movement and seasonal migration. Recolonization is desirable of sites from which huemul have been extirpated (Thornback & Jenkins, 1982). Some of these measures have been implemented, but further action is necessary.

Field studies

Argentina.

- a) M.A. Diaz. Huemul de Lago San Martin, Argentina 1990.
- b) A. Serret. Proyecto Huemul (P.N. Perito Moreno, Argentina 1990).

Chile.

- a) D. Aldridge. Proyecto huemul (Chile 1988).
- b) A. Povilitis. Proyecto Huemul (Chile 1976).
- c) CONAF/WWF. XI Region Huemul conservation project.
- d) CODEFF. VIII Region Huemul conservation project.

Reporters

Argentina. Eduardo J. Ramilo, Delegacion Tecnica Regional, Administracion de Parques Nacionales, Casilla de Correo 380, 8400 Bariloche, ARG., Ph: 0944-25436.

Alejandro Serret, Fundacion Vida Silvestre Argentina, Defensa 245, 6 Piso, 1065 Buenos Aires, ARG., PH:30-3778/4086.

Albert W. Franzmann, P.O. Box 666, Soldotna, Alaska 99669, PH: 907-262-4107.

(Mario A Diaz, Consejo Agrario Provincial, 9400 Rio Gallegos, Pcia. Santa Cruz, ARG. No reply yet).

Chile. Godofredo Stutzin, Camino El Alto, Parcela 14, El Arrayan, Santiago 34, Chile. Ph:0056-2-471643. FAX 0056-2-717593.

RED BROCKET DEER, *Mazama americana*, Temazate (Mex.), Venado cabra (Mex.), Corzuela roja (Arg.)

Distribution: (map)

See map #3. Eastern Mexico to northern Argentina (Nowak & Paradiso 1983).

Past Distribution:

Population Data:

A. *Status in Wild:*

B. *Estimated numbers in wild:*

Total: 100,000 (*M.a.americana*) in Suriname (Brannan & Marchinton 1987).
country-by-country

Macc-Lande Red Data Categorization: INDETERMINATE. *UNKNOWN*

C. *Status in captivity*

Not listed by Olney et al. (1989). ISIS (1990) lists 10.16.1 of 3 subspecies in 10 institutions.

Ecology and Reproduction:

A. *Habitat and Food Preference:*

B. *Average group size and dispersion pattern:*

C. *Movements:*

D. *Time of Calving:*

E. Age at first reproduction:

Causes of Decline:

Varies locally.

Protected areas:

Occurrence outside existing protected areas:

Conservation Action:

Field studies:

Reporters:

BROCKET DEER, (*Mazama chunyi*)

Distribution (map)

See map #3. Andes of southern Peru and Bolivia (Nowak & Paradiso 1983).

Past Distribution:

Population Data:

- A. *Status in Wild*
country-by-country
Mace-Landc Red Data Categorization
- B. *Estimated numbers in wild:*

C. *Status in captivity:*
Not listed by Olney et al. (1989).

Ecology and Reproduction:

- A. *Habitat and Food Preference:*
- B. *Average group size and dispersion pattern:*
- C. *Movements:*
- D. *Time of Calving:*
- E. Age at first reproduction:

Causes of Decline:

Protected areas:

Occurrence outside existing protected areas:

Conservation Action:

Field studies:

Reporters:

BROWN BROCKET DEER, *Mazama gouazoubira*, "Gray brocket deer", "Venado de monte" (Uruguay), "Guazu" (Paraguay), "Guazubira" (Uruguay), "Temazate" (Mex.), "Corzucla parda" (Arg.).

Distribution: (map)

See map #3. Isla San Jose off southern Panama, Colombia and Venezuela to northern Argentina and Uruguay (Nowak & Paradiso 1983).

Past Distribution:

Population Data:

A. Status in Wild:

country-by-country

Mace-Landc Red Data Categorization: INDETERMINATE.

B. Estimated numbers in wild:

Paraguay: about 10,000.

Uruguay: "Abundant" (Verdier, pers. comm.).

C. Status in captivity:

Not listed by Olney et al. (1989).

Ecology and Reproduction:

A. Habitat and Food Preference:

B. Average group size and dispersion pattern:

C. Movements:

D. Time of Calving:

E. Age at first reproduction:

Causes of Decline: Habitat destruction and illegal hunting.

Protected areas:

Occurrence outside existing protected areas:

BROCKET DEER, (*Mazama nana*), "Guasu pytá" (Paraguay), "Corzucla cnana" (Arg.)

Distribution: (map)

See map #3. Brazil, Argentina, Paraguay, Bolivia (Grubbs, 1989). Naturally restricted, locally scattered throughout its range; restricted to the extreme north-east of Paraguay in an area containing historically inundated floodplain, which is now seasonally inundated in some areas (Brooks pers. comm.).

Past Distribution:

Population Data:

A. Status in Wild:

Paraguay. Restricted in distribution and at low density; probably decreasing in numbers (Brooks, pers. comm., Sosa Yubero, pers. comm.).

country-by-country

Mace-Lande Red Data Categorization

B. Estimated numbers in wild:

C. Status in captivity:

Not listed by Olney et al. (1989).

Ecology and Reproduction:

A. Habitat and Food Preference: Seasonally inundated palm savannah or savannah, typified by short monotypic grass and statified chaco forest marginally (Brooks, pers. comm.).

B. Average group size and dispersion pattern:

C. Movements:

D. Time of Calving:

E. Age at first reproduction:

Causes of Decline:

Protected areas:

Occurrence outside existing protected areas:

Conservation Action: (Recommended). An initiative to establish a tri-country reserve on the Paraguay/Bolivia border has been started (Brooks, pers. comm.).

Field studies:

Reporters:

LITTLE RED BROCKET DEER, *Mazama rufina*

Distribution: See map #3. the Andes from western Venezuela to Ecuador, (Grubb, 1989).

Past Distribution:

Population Data:

A. Status in the Wild:

country-by-country

Macc-Lande Red Data Categorization: VULNERABLE.

B. Estimated numbers in wild: Fewer than 10,000 (Wirth pers. comm.).

C. Status in captivity:

Not listed by Olney et al. (1989).

Ecology and Reproduction:

A. Habitat and Food Preference:

B. Average group size and dispersion pattern:

C. Movements:

D. Time of Calving:

E. Age at first reproduction:

Causes of Decline:

Protected areas: Possible (in cloud forest).

Occurrence outside existing protected areas:

Conservation Action: Need to conduct a survey to determine existing range, numbers surviving in the wild.

Field studies:

Reporters:

PAMPAS DEER, (*Ozotoceros bezoarticus* subsp.), "venado" (Arg, Uruguay), "gama" (Arg.), "venado de campo" (Uruguay), "veado campiero" (Bra.), "veado branco" (Bra.)

Macc-Lande Red Data Categorization:

The *O.b. celer* population is considered CRITICAL, while the subspecies *O.b. bezoarticus* and *O.b. leucogaster* are classified as ENDANGERED.

Distribution: See map ___. Occurs in insulated populations throughout remnants of its native Pampas grassland habitat in western, northern and central Argentina, eastern Bolivia, Brazil south of the Amazon, Paraguay, and Uruguay (Thornback & Jenkins, 1982, Nowak & Paradiso, 1983(CHECK REFERENCE), all reporters, pers. comm.).

Past Distribution: Previously distributed throughout the open pampas grasslands of South America (Jackson, 1987).

Population Data:

A. Status in Wild: The species is listed as endangered by USDI and is on Appendix I of CITES (Nowak & Paradiso, 1983). CHECK REFERENCE.

Argentina. Found from 0-700m above sea level, in scattered groups on private ranches in San Luis Province and in Buenos Aires Province at Bahia Samborombón and Campos del Tuyú. Generally restricted in distribution and at low density (Thornback & Jenkins, 1982, Jackson, pers. comm., de Anchorena, pers. comm.). The San Luis population was estimated to number 300 animals in 1980 (Thornback & Jenkins, 1982), but is currently estimated at 150 animals with continued decline (Jackson, pers. comm.). The Samborombón population is estimated at 80 animals and decreasing (de Anchorena, pers. comm.), while the adjacent Campos del Tuyú population was estimated at 30 and declining in 1980 (Thornback & Jenkins, 1982); together, these populations have been estimated at about 250 and stable in 1990 (M. Gimenez Dixon, pers. comm.).

Brazil. Found from 0-900m above sea level in the States of Mato Grosso, Goias, Mato Grosso do Sul, Minas Gerais, São Paulo and Rio Grande do Sul in savannah and grassland. Restricted in distribution and at low densities (Pinder, pers. comm.). The Emas National Park population was estimated at 1000 animals and "healthy" (Redford, 1987), but now is estimated at 180-270 animals and is considered "stable"; a Minas Gerais ranch population is estimated at 15 and "decreasing"; the Caiman ranch population (MS) (SPELL OUT) is estimated at 60 animals and "stable"; and the Campo Dora ranches' population is estimated at 75-105, with an "unknown" population trend (Pinder, pers. comm.). Our conservative (e.g. maximum population size) estimate for Brazil's population is about 2000 animals.

Paraguay. Very low numbers, if it is still extant (Juan Villalba, pers. comm.). Possibly still extant in the Chacoan Pampas in or near Teniente Enciso National Park (Brooks, pers. comm.). Sosa Yubero (pers. Comm.) considers it widespread, but at low density.

Uruguay. Restricted, insular populations are estimated to total 800-1000 and to be relatively stable (Verdier, pers. comm., Muller-Schwarze & Moore, unpublished census data). In 1963, the Los Ajos population was estimated at 300 animals, and it is now about 100 animals and "stable" (Verdier, pers. comm.); small populations in Artigas, Rio Negro and other departments are decreasing or extinct; a large population (1990 estimate 700-800 animals) in Arroyo El Tapado, Salto is stable or increasing due to a protective estancia owner and his gauchos.

B. Estimated numbers in wild: Total numbers remain unknown, but are estimated at about 3,500 (Muller-Schwarze & Moore, unpublished).

Argentina: (O.b. celer) Under 400 animals.

Brazil: About 2,000 animals.

Paraguay: Numbers unknown, but apparently very low (Brooks, pers. comm.).

Uruguay: About 1,000 deer (Muller-Schwarze and Moore, unpublished).

C. Status in captivity:

Olney et al. (1989) recorded 15.11 in 4 collections (30.26 in 5 collections if Piriapolis, Uruguay is included). ISIS (1990) recorded only 6.7.1 held by the SDZ and WAP, and lists the species as *Blastoceros campestris*. The current captive population throughout Uruguay is between 60 and 80 animals, over 50 at Piriapolis and 10 at Durazno in 1990 (Moore, pers. obs.). The estancia La Corona, in Argentina, started with 21 animals in semi-captivity; the population increased to 43, then declined to about 20 in 1987 due to cattle diseases (Rozemburg, 1987), and to 15 in 1990 (de Anchorena, pers. comm.). The international studbook keeper for the species is Dr. Hans Frädrieh, Zoologischer Garten Berlin, Hardenbergplatz 8, D-1000 Berlin 30, Germany.

Ecology and Reproduction:

A. Habitat and Food Preference: Pampas deer originally inhabited diverse open habitats; this is reflected in the variety of sites where they still survive, from the salt marsh of Bahia de Samborombón to insular climax grasslands in San Luis, Argentina and Salto Uruguay (Jackson & Langguth, 1987; Muller-Schwarze & Moore, pers. obs.). The species was once the principal mammalian herbivore in the extensive pampas grasslands of South America (Jackson & Langguth, 1987).

In Brazil, it feeds mostly on Fabaceae, Euphorbiaceae, and Sterculiaceae (Pinder, pers. comm.). In Uruguay, it feeds on many grasses in the spring (Moore & Muller-Schwarze, pers. obs.), but food preferences are not known; more than 400 species of grasses are present on the Uruguayan Pampas (???? pers. comm.).

B. Average group size and dispersion pattern:

C. Movements:

D. Time of Calving: About 90% of births occur from August to April (Jackson & Langguth, 1987), but fawns have been observed in all months of the year (Redford, 1987). Gestation is about seven months, and females can give birth every ten months (Frädrieh, 1981). Pampas deer always give birth to a single fawn, but Redford (1987) reported one Brazilian female with two similar-sized young. Jackson and Langguth (1987) reported that over 85% of males were in hard antler between January and July, and from August to November 70% of the males were in velvet.

E. Age at first reproduction: Unknown.

Causes of decline:

a) *Argentina.* In the past, commercial hunting, disease and competition from domestic livestock, habitat change; presently, harassment by humans and continued habitat change (Jackson, pers. comm.). Poaching at Samborombón is still a problem (Stegmann, pers. comm.).

b) *Brazil.* Most Pampas habitat is disappearing in the central plateau of Brazil due to extensive soy bean plantations. In the state of Bahia, pampas deer are illegally killed for the meat market. In the Pantanal, foot-and-mouth disease is probably the major problem since humans have not yet been able to drastically modify the habitat. Also, ranchers in the Pantanal still encourage the use of game meat by their employees (Pinder, pers. comm.).

c) *Paraguay.* If the deer still exists, it is probably poached by hungry soldiers, because the

military is stationed just outside the park entrance (Brooks, pers. comm.)

d) *Uruguay*. Aftosa and other livestock diseases have killed many deer in the past. Habitat destruction in the last 30 years has caused the decline at Los Ajos, Rocha. Competition with sheep and other livestock contributes in some way (cause and effect not yet known) to deer population decline. Fences prevent movements of individuals and herds. Illegal hunting remains a problem. Domestic dogs may also be a problem (Moore & Muller-Schwarze, in litt.; Verdier, pers. comm.).

Native Subsistence Use:

Commercial Uses:

Protected areas:

Argentina. Campos del Tuyu, Buenos Aires Province, has a deer management plan (Jackson, 1978); protection for the species in this reserve is considered adequate (Rozemberg, 1987; Jackson, pers. comm.). The species has been declared a Natural Monument, and so is protected on paper throughout Buenos Aires Province; real protection at Samborombón is considered inadequate (de Anchorena, pers. comm.).

Bolivia. Apparently found in P.N. Kempff, P.N. El Beni, but numbers and trends unknown (Tariffa, pers. comm. to Verdier, 1990).

Brazil. Emas National Park has a "commonly seen" population estimated at 270 animals; there is a management plan for the park, but it does not specifically provide for the management of this species. Protection is considered inadequate due to: the small park staff (only four); inaccessible remote areas of the park; insufficient fuel to patrol the park; encroachment by neighboring soy farmers (Pinder, pers. comm.). (**FIND Schaller 1976. Report on a wildlife survey in northern Argentina and in the Emas National Park, Brazil, 17 pp unpub.**) P.N. Chapada dos Veadeiros, Goiás (IBAMA, 1989), numbers unknown, park not yet appropriated by the Brazilian government. P.N. Brasília, est. 110 and decreasing in 1977 (Schaller & Vasconcelos, census), now rarely seen, no management plan for the species (Pinder, pers. comm.). P.N. Serra da Canastra, Minas Gerais, up to 1981 rarely seen, current status unknown, protection of park adequate but there is no management plan for the species (Pinder, pers. comm.). Araguaia N.P., Tocantins, has federal road crossing the park that allowed squatters to move in; Indians are also allowed to live inside the park (Pinder, pers. comm.). P.N. Aparados de Serra, Catarina, numbers unknown. P.N. Chapada dos Guimaraes, Mato Grosso, #s unknown. P.N. Grande Sertao Veredas, Minas Gerais, numbers unknown. (Last 3 IBAMA 1989, cited by Verdier, pers. comm.). Sub Região Pantaneira da Nhecolândia, Mato Grosso do Sul (Tomas, 1988), numbers unknown. Uhe da Sta. Rita Municipios de Chapada do Norte, Minas Gerais (Silva et al., 1990). Jaragua do Sul, Catarina (Azevedo et al., 1982). Last 3 also referred by Verdier, pers. comm..

Paraguay. Possibly Teniente Enciso (Brooks pers. comm.).

Uruguay. Only occurs on private estancias; official status "Reserva Privada" is planned for Estancia El Tapado as part of Uruguay's country-wide conservation plan sponsored by the Organization of American States (???? 1990).

Occurrence outside existing protected areas:

Argentina. The pampas deer occurs in San Luis province. No ecosystem reserve for the pampas grassland exists, so the original pampas habitats occur only in undisturbed, isolated pockets such as railway rights-of-way and a few traditional estancias which still have extensive tracts of climax grassland (Jackson, pers. comm.).

Brazil.

Uruguay. The largest population is in the state of Salto, where we have censused over 300 deer on one 8.75 km² pasture (Muller-Schwarze & Moore, unpublished). The total state population is

estimated at 600-800 and is probably increasing (Muller-Schwarze & Moore, unpublished; Verdier, pers. comm.). At Los Ajos in Rocha, there is a currently stable population of about 100 deer, a decline from an estimated 300 animals in 1963 (Verdier, pers. comm.).

Conservation Action:(Recommended)

a) *Argentina.*

1) **Create protected areas.** Creation of a habitat reserve is urgently necessary for the San Luis population. The population has declined from 300 to 150 animals in the last decade (Jackson, pers. comm.). The deer are located in the last remaining climax pampas grasslands, there is currently no ecosystem reserve for any expanse of pampas grasslands.

2) **Law enforcement.** Although the deer at Samborombón are "protected", poaching still occurs (Stegmann, pers. comm.); better protection by local law enforcement officials is necessary.

3) **Public education.** There is a need to develop a conservation ethic throughout the country, by schools and NGOs; following conservation education, all native species will be better appreciated, therefore better conserved.

4) **Captive breeding.** Several captive populations should be established; reinforce existing populations with additional founders. Blood or other tissue samples should be collected for molecular genetic studies by competent investigators.

b) *Brazil.*

1) **Law enforcement.** Although hunting is considered a crime by the new Brazilian constitution, many ranchers in the Pantanal encourage their employees to eat game meat to reduce the maintenance costs of running a ranch (Pinder, pers. comm.); illegal hunting must be controlled.

2) **Create protected areas.** Core areas and buffer zones must be created to prevent habitat decline due to intensive agriculture (e.g. extensive soy farming). Cattle numbers should be reduced in these areas to prevent disease transmission from cattle to marsh deer.

3) **Develop ecotourism.** Cattle ranchers and other landowners should be encouraged to promote ecotourism as an additional source of income.

4) **Increase knowledge of life history.** Behavioral and ecological studies of the species should be conducted (Pinder pers. comm.).

5) **Captive breeding.** Several captive populations should be established; reinforce existing populations with additional founders. Blood or other tissue samples should be collected for molecular genetic studies by competent investigators.

c) *Paraguay.*

1) **Surveys needed.** Remaining populations should be located and strictly protected.

d) *Uruguay* (Moore, Muller-Schwarze and Verdier contributed to this summary).

1) **Create protected areas.** Core areas, free of livestock, and buffer zones in which agricultural use of the pampas is not intense (e.g. low-level cattle ranching), should be instituted to conserve the pampas grassland and its supporting rich soils. At present, the possibility exists to establish a deer reserve by purchasing land adjacent to the estancia where deer occur. Estimated cost for one estancia in Depto Salto = \$3,000,000.

2) **Law enforcement.** Strict protection of the pampas deer is still necessary: a trophy head from Uruguay may bring US\$2,000 in Argentina (Moore, pers. comm. with gauchos in Uruguay), while a pampas deer skin may be sold for US\$15-20 (Pinder, pers. comm.); some gauchos' monthly wage is only US\$25, while a peon's wage is less than that (Moore, pers. comm. with gauchos), so the economic benefit of poaching is apparently greater than the current cost of being caught poaching.

Guard stations in areas where the deer exist, and more guards, may be necessary to augment protection of the species (currently the responsibility of private landholders).

3) **Increase knowledge of life history.** Ecological studies are needed, especially to compare

the Los Ajos and Salto populations. Recovery of the species could be enhanced at a later date if the feeding biology and nutritional needs of this species were studied now, while some natural climax grassland remains. An experimental management approach which excludes sheep, or sheep and cattle, from pastures where pampas deer still exist, is desirable in order to determine the influence of sheep and cattle on deer.

Periodic censuses are needed to track population trends.

The taxonomic position of the Uruguayan race should be compared to those of Argentina and Brazil, using morphological and molecular studies. A long-range plan is needed for conservation of genetic material, especially in very small, insular populations.

El Tapado Pampas deer preserve project estimated costs (for two years): Vehicle=\$20,000; Gas, fuel, repairs, tires = \$8,000; fence for repair of current deer pasture fence (to exclude sheep) = \$20,000; Estancia housing (Room & board) = \$7,200; travel for U.S. investigators = \$10,000; municipal per diem for US investigators = \$4,000; hardware (field computers, still cameras, etc.) = \$12,000; supplies = \$2,000; publication costs = \$1200; US investigators' salary costs = \$36,000; guard salary costs = \$12,000; veterinary consultants (includes travel, per diem, supplies = \$15,000; botanical consultants (Urug.) = \$8,000; Total = \$135,400.

4) **Policy development.** Restriction of livestock ranching, especially sheep grazing, on some climax grasslands, would be desirable; in this regard, conservation easements for certain landowners (those with strong conservation ethics, vast tracts of land and large herds of Pampas deer) would be desirable -- Uruguay needs to work out a cooperative, interagency mechanism to do this between wildlife and tax ministry officials.

Legal, clearly understood, authority of wildlife biologists and managers to conduct biological studies in accordance with professionally established procedures, and to implement necessary conservation measures, must be established.

5) **Captive breeding.** Consistency in conservation ethic and in captive management is needed in local zoo managers: although Piriapolis has been successful in taking from the wild, maintaining and reproducing the species, other zoos have poached fawns from private lands, then the fawns have died due to lack of human expertise in hand-rearing the animals (Moore & Verdier pers. comm.).

Reinforce existing captive and wild populations with additional founders as necessary. Blood or other tissue samples should be collected for molecular genetic studies by competent investigators.

Any reintroductions from zoos should receive prior approval and be well-planned with wildlife ministry biologists; they certainly should be well-documented.

6) **Public education.** There is a need to develop a conservation ethic throughout the country, by schools or NGO's; following conservation education, all native species will be better appreciated, therefore better conserved.

Field studies:

- a) Frans Leeuwenberg. IBGE Reserve, Brasilia.
- b) Lic. Mariano Merino. Diet of *Ozotoceros bezoarticus* at Reserva El Tuyu.
- c) Don Moore & Dietland Muller-Schwarze. Behavioral ecology of Pampas deer in Salto, Uruguay.
- d) Laurenz Pinder. Behavior and ecology of pampas deer in western Brazil.
- e) Ignacio Verdier. Pampas deer at Los Ajos, Uruguay.
- f) Wilfrido Sosa Yubero. Areas prioritarias para la conservacion en la region Oriental del Paraguay.

Reporters

Argentina: Dr. Manuel de Anchorena, Estancia La Corona, 7226 Villanueva, Buenos Aires, Arg.

Dr. John Jackson, the Royal Forestry Society, 102 High St., Tring, Herts., HP23 4AF, United

Kingdom

Brazil: Laurenz Pinder, 118 Newins-Ziegler Hall, Univ. Florida, Gainesville, FL, 32611-0304, United States

Paraguay: Dan Brooks, Dept Biol. Sci., Texas Tech University, Box 4149, Lubbock, TX 79409-3131 US

Uruguay: Don Moore, Burnet Park Zoo, 500 Burnet Park Dr, Syracuse, NY 13204, US

Dietland Muller-Schwarze, Dept. Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210 USA

Lic. Ignacio Verdier, Secc. Etologia, Facultad de Ciencias, Tristan Narvaja 1674, 11200 Montevideo, Uruguay

NORTHERN PUDU, (*Pudu mephistopheles*)

Distribution: See map 5. The Andes of Colombia, Ecuador and northern Peru (Nowak & Paradiso, 1983), in the montane paramos (Macnamara & Eldridge, 1987).

Past Distribution:

Population Data:

A. Status in Wild: On Appendix II of CITES (Nowak & Paradiso, 1983). Status indeterminate, due to sparse distribution and inconspicuous habits; thought to be declining in numbers due to habitat destruction and hunting pressure (Thornback & Jenkins 1982).

B. Estimated numbers in wild: Unknown.
Mace-Lande Red Data Categorization: INDETERMINATE.

C. Status in captivity
None recorded.

Ecology and Reproduction:

- A. Habitat and Food Preference:*
- B. Average group size and dispersion pattern:*
- C. Movements:*
- D. Time of Calving:*
- E. Age at first reproduction:*

Causes of Decline: Habitat destruction and exploitation.

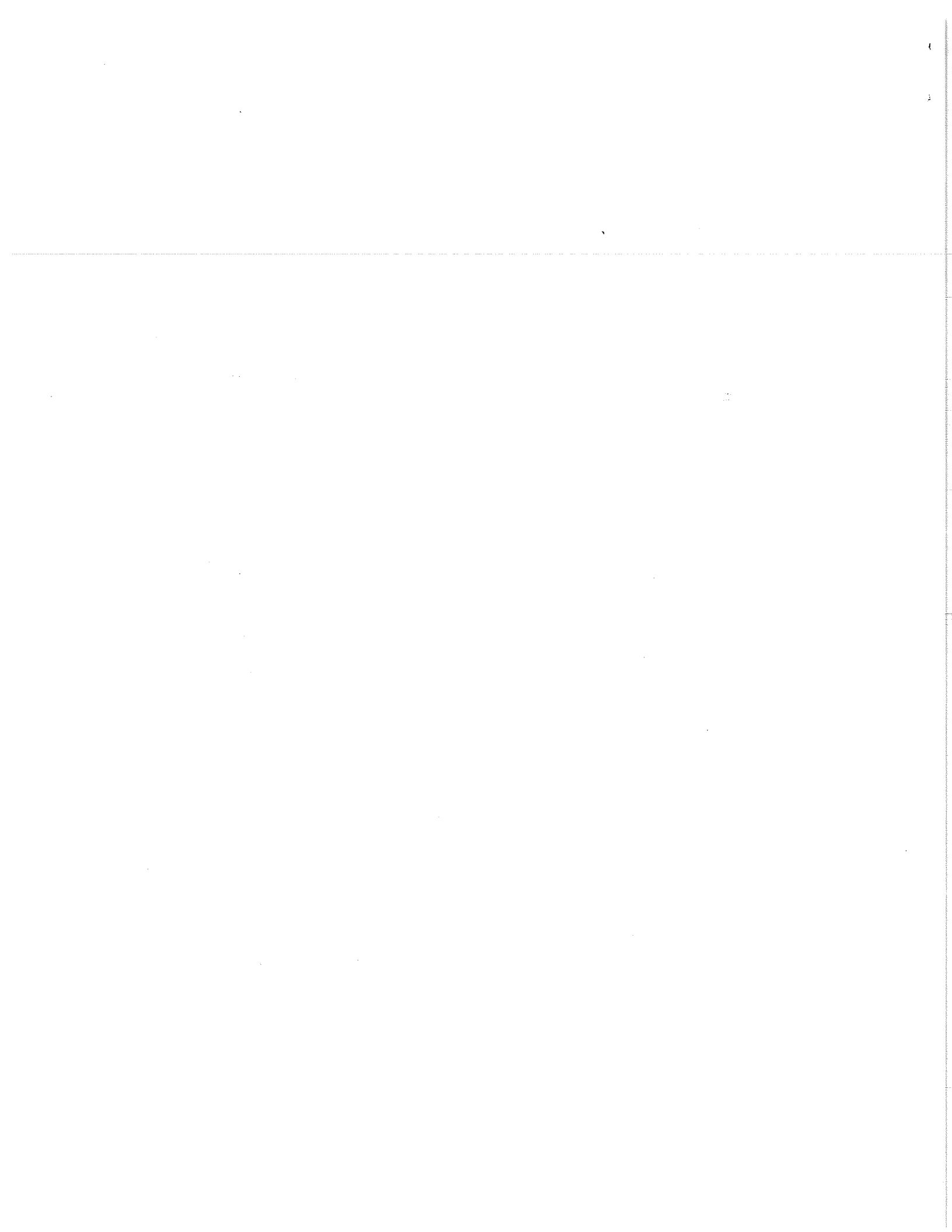
Protected areas:

Occurrence outside existing protected areas:

Conservation Measures for the Species:

Field studies:

Reporters:



SOUTHERN PUDU, (*Pudu puda*)

Mace-Lande Red Data Categorization: VULNERABLE.

Distribution: See map _____. Southern Chile and southwestern Argentina (Nowak & Paradiso, 1983), in the Valdivian forests (MacNamara & Eldridge, 1987).

Argentina. The present extremes of distribution of the species is from the northern border of Lanin N.P. to the southern border of Los Alerces N.P. These are the extremes of distribution confirmed by the Argentine National Parks Administration technical delegation, although they feel the species may range further south. Eastwardly, the pudu does not live beyond the forest edge. A reintroduced population on 4,000 hectare Victoria Island (within Nahuel Huapi N.P.) is included in this current distribution (Ramilo, pers. comm.).

Chile. Reduced considerably from former range from 35 degrees south latitude along the coastal range and Andean foothills of Chile to 49 degrees south latitude, with about 5 million hectares of pudu habitat remaining (Miller et al., 1973; Eldridge et al., 1987).

Past Distribution: The Argentine National Parks Administration has never recorded the species in Los Glaciares or Perito Moreno National Parks, so biologists there question whether the pudu ranges to 50 degrees south latitude as it does in Chile. They note that Los Glaciares has large areas of apparently suitable habitat for pudu, while Perito Moreno N.P. has one unconfirmed record for the species. Huemuls exist in both parks, and they consider it very improbable that pudus were extirpated while huemuls continued to survive. They conclude that the pudu was never present in either National Park (Ramilo, pers. comm.). In Chile, 35 degrees south latitude to 49 degrees south latitude (Eldridge et al., 1987), possibly to 53 degrees south (Reyes Toledo 1991).

Population Data:

A. Status in Wild: On Appendix I of CITES, listed as Endangered by USDI (Nowak & Paradiso, 1983).

Argentina. Widespread, but at low density (Ramilo, pers. comm.).

Chile. Listed as Vulnerable, likely to move into the Endangered category if causal factors of population decline continue (Glade, 1987).

B. Estimated numbers in wild:

Total. Fewer than 10,000.

Argentina. The area still covered by the Andean-Patagonian forest is still considered a large proportion of the original, and the population is considered stable because of this (Ramilo, pers. comm.).

Chile. More than 5 million hectares of pudu habitat remained 20 years ago, so that the present population in Chile probably numbers in the thousands, but anthropogenic habitat change has caused a decline in the species range (Miller et al., 1973).

C. Status in captivity:

Olney et al. (1989) recorded 26.25 *Pudu puda* in 8 collections. ISIS (1990) recorded 39.36 in 12 collections. The international studbook keeper for the species is Dr. Ulrich Schurer, Zoologischer Garten der Stadt Wuppertal, Hubertusallee 30, D-5600 Wuppertal 1, Germany.

Universidad de Concepción: About 50 animals (Dr. Eugenia Reyes Toledo, pers. comm.).

Ecology and Reproduction:

A. *Habitat and Food Preference*: Inhabits temperate forests of dense vegetation, principally humid southern beech (*Nothofagus* spp.) with an understory of bamboo (*Chusquea*), *Berberis* spp. and maqui (*Aristotelia*) (Ramilo, pers. comm., Nowak & Paradiso, 1983). The Valdivian temperate rain forest is composed of broad-leaved evergreen trees, primarily *Nothofagus dombeyi*; the summer-green deciduous forest is primarily deciduous *N. oblique* or *N. alpina*, but includes the evergreens *Laurelia sempervirens* and *Persea lingue* (MacNamara & Eldridge, 1987). The reintroduced population on Victoria Island uses native habitat altered by exotic deer (*Cervus elaphus*, *Dama dama*), and has adapted somewhat to exotic plants (*Sarothamnus scoparius*, *Rosa eglanteria*) (Ramilo pers. comm.).

The species forages for succulent sprouts and fruits (Miller et al., 1973).

B. *Average group size and dispersion pattern*: Solitary individuals, or at most two animals (Ramilo, pers. comm.).

C. *Movements*: Eduardo Ramilo (pers. comm.) monitored reintroduced animals with radio-collars and observed the following: animals born in captivity stayed within a restricted area post-release, near the area where they had been reared in captivity, and were never recorded farther away than 1 kilometer; two wild-caught, young males (<one year) were released immediately on Victoria Island, and travelled through most of the 4,000 hectare, 20 kilometer-long island. Home range of animals on Victoria Island was 16-26 hectares (Eldridge et al., 1987).

D. *Time of Calving*: In captivity in Argentina, from the beginning or middle of November to December (Ramilo, pers. comm.; Saizar, 1987). Rut occurs in April, May and June (MacNamara & Eldridge, 1987).

E. Age at first reproduction:

F. Sex ratio at birth:

Causes of Decline:

Argentina: Ramilo (pers. comm.) reports that the pudu has not been subject to significant hunting pressure in Argentina, and still has large tracts of original forest available to it. Population declines are more local phenomena, due to: serious habitat alterations caused by human settlement, forest exploitation followed by grazing, or overgrazing in forest areas which results in a sparse understory; predation by dogs, or extirpation due to the cattle-human-dog commensal group. In areas where livestock grazing is light, allowing regeneration of the forest, pudu are present in the less exploited areas; also, pudu use secondary forest habitat which develops following fire or timber exploitation (Ramilo, pers. comm.). However, in severely disturbed habitats with little protective cover, predation by pumas (*Felis concolor*) and foxes (*Dusicyon griseus*) can be severe (Eldridge et al., 1987).

Protected areas:

Argentina. The species is commonly seen in P.N. Los Alerces, protection is considered adequate, but there is no management plan; it is occasionally seen in P.N. Lago Puelo, where protection is considered adequate, but there is no management plan; it is occasionally seen in P.N. Nahuel Huapi, protection is considered adequate, but there is no management plan; it is also occasionally seen in P.N. Lanin, protection is considered adequate, but there is no management plan (Ramilo, pers. comm.).

Chile. Pudu inhabit 25 national parks and protected areas; these areas total 2.9 million hectares.

Occurrence outside existing protected areas:

Argentina. The species is found in forested areas between Nahuel Huapi and Puelo National Parks, and between Puelo and Los Alerces National Parks (Ramilo, pers. comm.).

Conservation Action: (Recommended)

1) **Habitat management.** Reduce habitat destruction and depletion by cattle and red deer; exclude these species from critical pudu management areas. The pudu's montane habitats also constitute the watersheds which are critical for providing clean drinking water for humans.

In timber-growing areas of the Precordillera, certain timber companies have agreed to space their Monterey pines, so that sunlight penetrates and permits undergrowth for cover of the pudu (Müller-Schwarze, pers. obs.).

2) **Captive breeding and Reintroductions.** Continue systematic captive breeding, transfer animals to adaptation zone in Precordillera, for eventual reintroduction into 3 National parks in the Andes (Project Leader: Eugenia Reyes Toledo, Universidad de Concepcion; International Consultant: Dietland Müller-Schwarze).

Costs: \$75,000 for 5 years to the Universidad de Concepcion, \$9,000 for 3 site visits for Müller-Schwarze for a total cost of \$84,000.

Field studies:

Reporters:

AXIS DEER, (*Axis axis*), "Ciervo axis" (Arg., Chile)

Distribution: See maps ____.

Past Distribution:

Population Data:

A. *Status in Wild:*

B. *Estimated numbers in wild:*

C. *Status in captivity*

Ecology and Reproduction:

A. *Habitat and Food Preference:*

B. *Average group size and dispersion pattern:*

C. *Movements:*

D. *Time of Calving:*

Causes of Decline:

Protected areas:

Occurrence outside existing protected areas:

Conservation Action:

Field studies:

Reporters:

RED DEER, (*Cervus elaphus*)

Distribution: See maps ____.

Past Distribution:

Population Data:

A. *Status in Wild:*

B. *Estimated numbers in wild:*

C. *Status in captivity*

Ecology and Reproduction:

A. *Habitat and Food Preference:*

B. *Average group size and dispersion pattern:*

C. *Movements:*

D. *Time of Calving:*

Causes of Decline:

Protected areas:

Occurrence outside existing protected areas:

Conservation Action:

Field studies:

Reporters:

FALLOW DEER, (*Dama dama*)

Distribution: See maps 6 & 7.

Past Distribution:

Population Data:

A. Status in Wild:

B. Estimated numbers in wild:

C. Status in captivity

Ecology and Reproduction:

A. Habitat and Food Preference:

B. Average group size and dispersion pattern:

C. Movements:

D. Time of Calving:

Causes of Decline:

Protected areas:

Occurrence outside existing protected areas:

Conservation Action:

Field studies:

Reporters:

III) Summaries of Recommended Conservation Action on a National Basis

Argentina

MARSH DEER, (*Blastocerus dichotomus*). M/L: VULNERABLE.

Protected areas: Ibera Natural Preserve, Corrientes Province ("commonly seen"); Parque Nacional Rio Pilcomayo, Formosa Province ("occasionally seen") (Beccaceci, pers. comm.). There is not a management plan. Protection is not considered adequate due to: lack of funds for ranger patrols; hunting on private properties that are part of the reserve; few acres of public land protected (Beccaceci).

Conservation Action: (Recommended)

1) **Surveys needed.** An accurate census of *Blastocerus* in captivity is needed; results should be entered into the International Species Information System. A larger captive population is probably needed.

A census of marsh deer in the wild is needed.

2) **Create protected areas.** More and/or well-protected reserves are needed. Reserves should be cattle-free inside their borders. Gold mining and soy farming currently encroach upon the Pantanal in Brazil.

3) **Public education.** A public educational campaign should discourage the use of the species' fur and meat until population size and stability are well-documented.

4) **Law enforcement.** Trophy hunting should be strictly controlled.

5) **Policy development.** Habitat protection and harvest controls should be legislated and enforced. Human encroachment must be controlled in core reserves and buffer zones; development policies can address this problem (roads create problems of squatters, gold miners and subsequent mercury poisoning of stream systems, etc.).

6) **Increase knowledge of life history.** Behavioral, ecological and disease studies of the species are necessary so that proper management can occur.

7) **Seek funding.** Financial support for conservation from bi-lateral and multi-lateral development banks may assist in the development and implementation of this conservation action plan.

8) **Develop ecotourism.** Ecotourism by cattle ranchers and other private landowners may be desirable. Note that this species occurs in the habitat where Maguari storks and other charismatic wading birds live and nest.

TARUCA, (*Hippocamelus antisensis*). M/L: INDETERMINATE.

Conservation Action: (Recommended)

1) **Reduce human/wildlife conflict.** Address problem of taruca foraging in alfalfa fields (compensate farmers, build fence to exclude taruca) (Carrasco, pers. comm.).

2) **Create protected areas.** Create parks and reserves to protect riparian and other habitat from development, and to provide for the biological needs of taruca.

Reduce competition by livestock; e.g. provide fence to prevent incursion by cattle onto habitat necessary for taruca.

HUEMUL, (*Hippocamelus bisulcus*). M/L: ENDANGERED.

Protected areas: P.N. Perito Moreno, about 100 individuals, "occasionally seen", protection considered adequate, no management plan (Serret and Ramilo, pers. comm.). P.N. Nahuel Huapi, "rarely seen", no management plan; 13% of the protected area is private land, settlers have livestock and dogs, so protection is considered inadequate (Ramilo, pers. comm.). P.N. Lago Puelo, "rarely seen", protection not adequate due to settlers and dogs, small size of park relative to viable populations

of deer, no management plan. P.N. Los Alerces, "occasionally seen", protection adequate, no management plan. P.N. Los Glaciares, "rarely seen", protection inadequate due to settlers with livestock and dogs and intense tourist use of some areas of the park, no management plan. (Ramilo pers. comm.). A group of 13 animals is estimated to live at the Rio Carrera Provincial Park (Serret pers. comm.).

Conservation Action: (Recommended)

1) **Create protected areas.** Creation of new protected areas, decreasing cattle numbers in protected areas, and control of introduced deer (e.g. *Cervus elaphus*) are necessary to prevent further habitat destruction and population decline (Ramilo, pers. comm.; Stutzin, pers. comm.). Re-establish the former altitudinal range of huemul habitat by moving livestock pastures to lower elevations; this includes purchase and restoration of grazing lands.

The huemul's montane habitats also constitute the watersheds which are critical for providing clean drinking water for humans.

To allow recovery of the species in Chile, CONAF managers are replanting *Nothofagus pumilio*, removing livestock from lower slopes, and are purchasing former livestock grazing lands to enlarge the Rio Simpson reserve (Müller-Schwarze, pers. obs.).

2) **Surveys needed.** A complete census of existing populations, creation of bi-national preserves on the Argentinian-Chilean border, development of binational conservation strategies (Serret, pers. comm.). Proyecto Huemul biologists are trying to locate and define population levels and demographic characteristics of Argentinian populations, in order to determine conservation problems faced by each insular population (de Chiesa 1988).

3) **Law enforcement.** Prevent further illegal hunting (Stutzin, pers. comm.).

4) **Seek funding.** Financial support for conservation from bi-lateral and multi-lateral development banks may assist in the development and implementation of this conservation action plan.

The following conservation measures were proposed a decade ago (Thornback & Jenkins, 1982): identification of surviving Huemul populations of significant size, evaluation of their habitat requirements and development of administrative programs to protect the survivors; establishment of Huemul/Ecosystem reserves along southern, central and northern portions of the Huemul's former range; creation of national and regional Huemul conservation teams and locally involved groups; implementation of a Huemul Recovery Team to help implement these measures. The areas where Huemul can survive as self-sustaining populations must be free from illegal hunting, uncontrolled fire, over-exploitation of rangelands and vegetation, and hazards posed by domestic animals; they must be large and different enough in habitat to support a large, self-sustaining population of huemul to minimize the chance of extinction due to random events or natural catastrophe, and to allow free movement and seasonal migration of Huemul; recolonization of sites from which Huemul have been extirpated is desirable (Thornback & Jenkins, 1982). Some of these measures have been implemented, but further action is necessary.

PAMPAS DEER, (*Ozotoceros bezoarticus celer*). M/L: CRITICAL.

Protected areas: Campos del Tuyu, Buenos Aires Province, which has a management plan for the deer (Jackson, 1978); protection for the deer in this reserve is considered adequate (Rozemburg 1987, Jackson pers. comm.). The species has been declared a Natural Monument, so is protected on paper throughout Buenos Aires Province; real protection at Samborombón is considered inadequate (de Anchorena, pers. comm.).

Conservation Action: (Recommended)

1) **Create protected areas.** Creation of a habitat reserve is necessary for the San Luis population; the deer are located in the last remaining climax pampas grasslands, there is currently no ecosystem reserve for any expanse of pampas grasslands, and the population has declined from 300 to

150 animals in the last decade (Jackson, pers. comm.).

2) **Law enforcement.** Although the deer at Samborombón are "protected", poaching still occurs (Stegmann, pers. comm.); better protection by local law enforcement officials is necessary.

3) **Public education.** There is a need to develop a conservation ethic throughout the country, by schools or NGO's; following conservation education, all native species will be better appreciated, therefore better conserved.

4) **Captive breeding.** Several captive populations should be established; reinforce existing populations with additional founders. Blood or other tissue samples should be collected for molecular genetic studies by competent investigators.

SOUTHERN PUDU, (*Pudu puda*). M/L: VULNERABLE.

Protected areas: The species is commonly seen in P.N. Los Alerces, protection is considered adequate, but there is no management plan; it is occasionally seen in P.N. Lago Puelo, where protection is considered adequate, but there is no management plan; it is occasionally seen in P.N. Nahuel Huapi, protection is considered adequate, but there is no management plan; it is also occasionally seen in P.N. Lanin, protection is considered adequate, but there is no management plan (Ramilo, pers. comm.).

Conservation Action: (Recommended)

1) **Habitat management.** Reduce habitat destruction and depletion by cattle and red deer; exclude these species from critical pudu management areas. The pudu's montane habitats also constitute the watersheds which are critical for providing clean drinking water for humans.

In timber-growing areas of the Precordillera, certain timber companies have agreed to space their Monterey pines, so that sunlight penetrates and permits undergrowth for cover of the pudu (Müller-Schwarze, pers. obs.).

2) **Captive breeding.** Continue systematic captive breeding, transfer animals to adaptation zone in Precordillera, for eventual reintroduction into 3 National parks in the Andes (Project Leader: Eugenia Reyes Toledo).

2) Conservation interest

Costs: \$75,000 to Universidad de Concepcion; \$9,000 for 3 site visits for Müller-Schwarze for a total cost of \$84,000.

Bolivia

MARSH DEER, (*Blastocerus dichotomus*). M/L: VULNERABLE.

Conservation Action: (Recommended)

1) **Surveys needed.** An accurate census of *Blastocerus* in captivity is needed; results should be entered into the International Species Information System. A larger captive population is probably needed.

A census of marsh deer in the wild is needed.

2) **Create protected areas.** More and/or well-protected reserves are needed. Reserves should be cattle-free inside their borders. Gold mining and soy farming currently encroach upon the Pantanal in Brazil.

3) **Public education.** A public educational campaign should discourage the use of the species' fur and meat until population size and stability are well-documented.

4) **Law enforcement.** Trophy hunting should be strictly controlled.

5) **Policy development.** Habitat protection and harvest controls should be legislated and enforced. Human encroachment must be controlled in core reserves and buffer zones; development

policies can address this problem (roads create problems of squatters, gold miners and subsequent mercury poisoning of stream systems, etc.).

6) **Increase knowledge of life history.** Behavioral, ecological and disease studies of the species are necessary so that proper management can occur.

7) **Seek funding.** Financial support for conservation from bi-lateral and multi-lateral development banks may assist in the development and implementation of this conservation action plan.

8) **Develop ecotourism.** Ecotourism by cattle ranchers and other private landowners may be desirable. Note that this species occurs in the habitat where Maguari storks and other charismatic wading birds live and nest.

TARUCA, (*Hippocamelus antisensis*). M/L: INDETERMINATE.

Conservation Action: (Recommended)

1) **Reduce human/wildlife conflict.** Address problem of taruca foraging in alfalfa fields (compensate farmers, build fence to exclude taruca) (Carrasco, pers. comm.).

2) **Create protected areas.** Create parks and reserves to protect riparian and other habitat from development, and to provide for the biological needs of taruca.

Reduce competition by livestock; e.g. provide fence to prevent incursion by cattle onto habitat necessary for taruca.

BROCKET DEER, (*Mazama nana*). M/L: VULNERABLE.

Conservation Action: (Recommended). An initiative to establish a tri-country reserve on the Paraguay/Bolivia border has been started (Brooks, pers. comm.).

PAMPAS DEER, (*Ozotoceros bezoarticus* subsp.). M/L: ENDANGERED.

2) Conservation interest

Brazil

MARSH DEER, (*Blastocerus dichotomus*). M/L: VULNERABLE.

Protected areas: Emas National Park ("rarely seen"). A management plan exists, but it does not provide specifically for the species. Protection is not adequate due to: a staff of only four individuals; not enough fuel to allow adequate patrols; remote parts of the park are not accessible; threat of encroachment into the park by neighboring soy farmers. Araguaia National Park (status "unknown"), no management plan exists. Protection in this national park is inadequate because there is a federal road that crosses the park, which allowed many squatters to settle in the area; also, Indians are allowed to live (and, presumably, hunt) inside the park. Caracara, Guapore and Jaru reserves are also believed to contain the species, but their numbers are unknown; in general, there is no protection against poaching in these reserves (Pinder, pers. comm.).

Conservation Action: (Recommended)

1) **Surveys needed.** An accurate census of *Blastocerus* in captivity is needed; results should be entered into the International Species Information System. A larger captive population is probably needed.

A census of marsh deer in the wild is needed.

2) **Create protected areas.** More and/or well-protected reserves are needed. Reserves should be cattle-free inside their borders. Gold mining and soy farming currently encroach upon the Pantanal in Brazil.

3) **Public education.** A public educational campaign should discourage the use of the species' fur and meat until population size and stability are well-documented.

4) **Law enforcement.** Trophy hunting should be strictly controlled.

5) **Policy development.** Habitat protection and harvest controls should be legislated and enforced. Human encroachment must be controlled in core reserves and buffer zones; development policies can address this problem (roads create problems of squatters, gold miners and subsequent mercury poisoning of stream systems, etc.).

6) **Increase knowledge of life history.** Behavioral, ecological and disease studies of the species are necessary so that proper management can occur.

7) **Seek funding.** Financial support for conservation from bi-lateral and multi-lateral development banks may assist in the development and implementation of this conservation action plan.

8) **Develop ecotourism.** Ecotourism by cattle ranchers and other private landowners may be desirable. Note that this species occurs in the habitat where Maguari storks and other charismatic wading birds live and nest.

PAMPAS DEER, (*Ozotoceros bezoarticus* subsp.). M/L: ENDANGERED.

Protected areas: Emas National Park has a "commonly seen" population estimated at 270 animals ; there is a management plan for the park, but it does not specifically provide for the management of this species. Protection is considered inadequate due to: only four park staff; inaccessible remote areas of the park; not enough fuel to patrol the park; encroachment on the park by neighboring soy farmers (Pinder, pers. comm.). (**FIND Schaller 1976. Report on a wildlife survey in northern Argentina and in the Emas National Park, Brazil, 17 pp unpub.**) P.N. Chapada dos Veadeiros, Goiás (IBAMA, 1989), numbers unknown, park not yet appropriated by the Brazilian government. P.N. Brasília, est. 110 and decreasing in 1977 (Schaller & Vasconcelos census), now rarely seen, no management plan for the species (Pinder, pers. comm.). P.N. Serra da Canastra, Minas Gerais, up to 1981 rarely seen, current status unknown, protection of park adequate but no management plan for the species (Pinder, pers. comm.). Araguaia N.P., Tocantins, has federal road crossing park that allowed squatters to move in, also Indians allowed to live inside park (Pinder pers. comm.). P.N. Aparados de Serra, Catarina, #s unknown. P.N. Chapada dos Guimarães, Mato Grosso, #s unknown. P.N. Grande Sertão Veredas, Minas Gerais, #s unknown. (Last 3 IBAMA 1989, cited by Verdier, pers. comm.). Sub Região Pantaneira da Nhecolândia, Mato Grosso do Sul (Tomas 1988), #s unknown. Uhe da Sta. Rita Municipios de Chapada do Norte, Minas Gerais (Silva et al. 1990). Jaraguá do Sul, Catarina (Azevedo et al., 1982). Last 3 also referred by Verdier, Pers. Comm..

Conservation Measures for the Species: (Recommended)

1) **Law enforcement.** Although hunting is considered a crime by the new Brazilian constitution, many ranchers in the Pantanal encourage their employees to eat game meat to reduce the maintenance costs of running a ranch (Pinder, pers. comm.); illegal hunting must be controlled.

2) **Create protected areas.** Core areas and buffer zones must be created to prevent habitat decline due to intensive agriculture (e.g. extensive soy farming). Cattle numbers should be reduced in these areas to prevent disease transmission from cattle to marsh deer.

3) **Develop ecotourism.** Cattle ranchers and other landowners should be encouraged to promote ecotourism as an additional source of income.

4) **Increase knowledge of life history.** Behavioral and ecological studies of the species should be conducted (Pinder, pers. comm.).

5) **Captive breeding.** Several captive populations should be established; reinforce existing populations with additional founders. Blood or other tissue samples should be collected for molecular genetic studies by competent investigators.

2) Conservation interest

Chile

TARUCA, (*Hippocamelus antisensis*). M/L: INDETERMINATE.
Conservation Action: (Recommended)

1) **Reduce human/wildlife conflict.** Address problem of taruca foraging in alfalfa fields (compensate farmers, build fence to exclude taruca) (Carrasco, pers. comm.).

2) **Create protected areas.** Create parks and reserves to protect riparian and other habitat from development, and to provide for the biological needs of taruca.

Reduce competition by livestock; e.g. provide fence to prevent incursion by cattle onto habitat necessary for taruca.

HUEMUL, (*Hippocamelus bisulcus*). M/L: ENDANGERED.

Protected areas: Nuble, Rio Simpson and Cerro Tamango nature reserves, where the deer are "rarely seen", but where protection is considered adequate (Stutzin, pers. comm.); management plans exist for Rio Simpson and Cerro Tamango (Müller-Schwarze, pers. obs.). B.O. Higgins National Park, which is a remote and very large national park, with inadequate personnel funding, so protection is considered inadequate; there is no management plan (Stutzin, pers. comm.).

Conservation Action: (Recommended)

1) **Create protected areas.** Creation of new protected areas, decreasing cattle numbers in protected areas, and control of introduced deer (e.g. *Cervus elaphus*) are necessary to prevent further habitat destruction and population decline (Ramilo, pers. comm.; Stutzin, pers. comm.). Re-establish the former altitudinal range of huemul habitat by moving livestock pastures to lower elevations; this includes purchase and restoration of grazing lands.

The huemul's montane habitats also constitute the watersheds which are critical for providing clean drinking water for humans.

To allow recovery of the species in Chile, CONAF managers are replanting *Nothofagus pumilio*, removing livestock from lower slopes, and are purchasing former livestock grazing lands to enlarge the Rio Simpson reserve (Müller-Schwarze, pers. obs.).

2) **Surveys needed.** A complete census of existing populations, creation of bi-national preserves on the Argentinian-Chilean border, development of binational conservation strategies (Serret, pers. comm.). Proyecto Huemul biologists are trying to locate and define population levels and demographic characteristics of Argentinian populations, in order to determine conservation problems faced by each insular population (de Chiesa, 1988).

3) **Law enforcement.** Prevent further illegal hunting (Stutzin, pers. comm.).

4) **Seek funding.** Financial support for conservation from bi-lateral and multi-lateral development banks may assist in the development and implementation of this conservation action plan.

The following conservation measures were proposed a decade ago (Thornback & Jenkins, 1982): identification of surviving huemul populations of significant size, evaluation of their habitat requirements and development of administrative programs to protect the survivors; establishment of Huemul/Ecosystem reserves along southern, central and northern portions of the Huemul's former range; creation of national and regional huemul conservation teams and locally involved groups; implementation of a Huemul Recovery Team to help implement these measures. The areas where huemul can survive as self-sustaining populations must be free from illegal hunting, uncontrolled fire, over-exploitation of rangelands and vegetation, and hazards posed by domestic animals; they must be large and different enough in habitat to support a large, self-sustaining population of huemul to minimize the chance of extinction due to random events or natural catastrophe, and to allow free movement and seasonal migration of huemul; recolonization of sites from which Huemul have been extirpated is desirable (Thornback & Jenkins, 1982). Some of these measures have been implemented, but further action is necessary.

SOUTHERN PUDU, (*Pudu puda*). M/L: VULNERABLE.

Protected areas: Pudu inhabit 25 national parks and protected areas; these areas total 2.9 million hectares (Reyes Toledo, pers. comm.).

Conservation Action: (Recommended)

1) **Habitat management.** Reduce habitat destruction and depletion by cattle and red deer; exclude these species from critical pudu management areas. The pudu's montane habitats also constitute the watersheds which are critical for providing clean drinking water for humans.

In timber-growing areas of the Precordillera, certain timber companies have agreed to space their Monterey pines, so that sunlight penetrates and permits undergrowth for cover of the pudu (Müller-Schwarze, pers. obs.).

2) **Captive breeding.** Continue systematic captive breeding, transfer animals to adaptation zone in Precordillera, for eventual reintroduction into 3 National parks in the Andes (Project Leader: Eugenia Reyes Toledo).

2) **Conservation interest**

Colombia

1) Data collection

2) Conservation interest

Ecuador

TARUCA, (*Hippocamelus antisensis*). M/L: INDETERMINATE.

Conservation Action: (Recommended)

1) **Reduce human/wildlife conflict.** Address problem of taruca foraging in alfalfa fields (compensate farmers, build fence to exclude taruca) (Carrasco, pers. comm.).

2) **Create protected areas.** Create parks and reserves to protect riparian and other habitat from development, and to provide for the biological needs of taruca.

Reduce competition by livestock; e.g. provide fence to prevent incursion by cattle onto habitat necessary for taruca.

2) Conservation interest

Guyana

1) Data collection

2) Conservation interest

French Guyana

1) Data collection

2) Conservation interest

Paraguay

MARSH DEER, (*Blastocerus dichotomus*). M/L: VULNERABLE.

Protected areas: P.N. Tinfunk, where it is occasionally seen, but protection is not considered adequate due to encroachment by local private landholders (Sosa Yubero, pers. comm.).

Conservation Action: (Recommended)

1) **Surveys needed.** An accurate census of *Blastocerus* in captivity is needed; results should be entered into the International Species Information System. A larger captive population is probably needed.

A census of marsh deer in the wild is needed.

2) **Create protected areas.** More and/or well-protected reserves are needed. Reserves should be cattle-free inside their borders. Gold mining and soy farming currently encroach upon the Pantanal in Brazil.

3) **Public education.** A public educational campaign should discourage the use of the species' fur and meat until population size and stability are well-documented.

4) **Law enforcement.** Trophy hunting should be strictly controlled.

5) **Policy development.** Habitat protection and harvest controls should be legislated and enforced. Human encroachment must be controlled in core reserves and buffer zones; development policies can address this problem (roads create problems of squatters, gold miners and subsequent mercury poisoning of stream systems, etc.).

6) **Increase knowledge of life history.** Behavioral, ecological and disease studies of the species are necessary so that proper management can occur.

7) **Seek funding.** Financial support for conservation from bi-lateral and multi-lateral development banks may assist in the development and implementation of this conservation action plan.

8) **Develop ecotourism.** Ecotourism by cattle ranchers and other private landowners may be desirable. Note that this species occurs in the habitat where Maguari storks and other charismatic wading birds live and nest.

BROCKET DEER, (*Mazama nana*). M/L: VULNERABLE.

Conservation Action: (Recommended). An initiative to establish a tri-country reserve on the Paraguay/Bolivia border has been started (Brooks, pers. comm.).

PAMPAS DEER, (*Ozotoceros bezoarticus* subsp.)

Protected areas. Possibly Teniente Enciso (Brooks, pers. comm.).

Conservation Action: (Recommended)

Surveys needed. Remaining populations should be located and strictly protected.

2) Conservation interest

Peru

MARSH DEER, (*Blastocerus dichotomus*). M/L: VULNERABLE.

Range in Perú: Occured in Pampas del Heath at an estimated density of 1 animal/140-200 Hectares; the area totals 6,000 hectares, which gave a total estimate for the habitat of 30-40 animals (Hofmann et al. 1976). Current numbers unknown.

Conservation Action: (Recommended)

1) **Surveys needed.** An accurate census of *Blastocerus* in captivity is needed; results should be entered into the International Species Information System. A larger captive population is probably needed.

A census of marsh deer in the wild is needed.

2) **Create protected areas.** More and/or well-protected reserves are needed. Reserves should be cattle-free inside their borders. Gold mining and soy farming currently encroach upon the Pantanal in Brazil.

3) **Public education.** A public educational campaign should discourage the use of the species' fur and meat until population size and stability are well-documented.

4) **Law enforcement.** Trophy hunting should be strictly controlled.

5) **Policy development.** Habitat protection and harvest controls should be legislated and enforced. Human encroachment must be controlled in core reserves and buffer zones; development policies can address this problem (roads create problems of squatters, gold miners and subsequent

mercury poisoning of stream systems, etc.).

6) **Increase knowledge of life history.** Behavioral, ecological and disease studies of the species are necessary so that proper management can occur.

7) **Seek funding.** Financial support for conservation from bi-lateral and multi-lateral development banks may assist in the development and implementation of this conservation action plan.

8) **Develop ecotourism.** Ecotourism by cattle ranchers and other private landowners may be desirable. Note that this species occurs in the habitat where Maguari storks and other charismatic wading birds live and nest.

TARUCA, (*Hippocamelus antisensis*). M/L: INDETERMINATE.

Conservation Action: (Recommended)

1) **Reduce human/wildlife conflict.** Address problem of taruca foraging in alfalfa fields (compensate farmers, build fence to exclude taruca) (Carrasco, pers. comm.).

2) **Create protected areas.** Create parks and reserves to protect riparian and other habitat from development, and to provide for the biological needs of taruca.

Reduce competition by livestock; e.g. provide fence to prevent incursion by cattle onto habitat necessary for taruca.

2) Conservation interest

Surinam

1) Data collection

2) Conservation interest

Uruguay

MARSH DEER, (*Blastocerus dichotomus*). M/L: VULNERABLE.

This deer possibly still existed as late as 1981 in Uruguay's Depto. Rocha (Bañado de Santa Terésa) (Thornback & Jenkins, 1982), but large swamp areas were seen to be drained in 1982 (Müller-Schwarze, pers. obs.), and the deer is now probably extinct in this country (Verdier, pers. comm.).

Conservation Action: (Recommended): If habitat becomes available, and can be protected, reintroductions from appropriate, nearby areas should be considered. (Costs associated with this project have not been investigated).

PAMPAS DEER, (*Ozotoceros bezoarticus* subsp.). M/L: ENDANGERED.

Conservation Action: (Recommended)

1) **Create protected areas.** Core areas, free of livestock, and buffer zones in which agriculture use on the pampas is not intense (e.g. low-level cattle ranching), should be established to conserve the pampas grassland and its supporting rich soils.

2) **Law enforcement.** Strict protection of the pampas deer is still necessary: a trophy head from Uruguay may bring US\$2,000 in Argentina (Moore, pers. comm. with gauchos in Uruguay), while a pampas deer skin may be sold for US\$15-20 (Pinder, pers. comm.); some gauchos' monthly wage is only US\$25, while a peon's wage is less than that (Moore, pers. comm. with gauchos), so the economic benefit of poaching is apparently greater than the current cost of being caught poaching pampas deer.

Guard stations in areas where the deer exist, and more guards, may be necessary to augment protection of pampas deer (currently the responsibility of private landholders).

3) **Increase knowledge of life history.** Ecological studies are needed, especially to compare the Los Ajos and Salto populations. Recovery of the species could be enhanced at a later date if the

feeding biology and nutritional needs of this species were studied now, while some natural climax grassland remains.

Periodic censuses are needed to track population trends.

The taxonomic position of the Uruguayan race should be compared to those of Argentina and Brazil, using morphological and molecular studies. A long-range plan is needed for conservation of genetic material, especially in very small, insular populations.

4) **Policy development.** Restriction of livestock ranching, especially sheep grazing, on some climax grasslands, would be desirable; in this regard, conservation easements for certain landowners (those with strong conservation ethics, vast tracts of land and large herds of Pampas deer) would be desirable -- Uruguay needs to work out a cooperative, interagency mechanism to do this between wildlife and tax ministry officials.

Legal, clearly understood, authority of wildlife biologists and managers to conduct biological studies in accordance with professionally established procedures, and to implement necessary conservation measures, must be established.

5) **Captive breeding.** Consistency in conservation ethic and in captive management is needed in local zoo managers: although Piriapolis has been successful in taking from the wild, maintaining and reproducing the species, other zoos have poached fawns from private lands, then the fawns have died due to lack of human expertise in hand-rearing the animals (Moore & Verdier, pers. comm.).

Reinforce existing captive and wild populations with additional founders as necessary. Blood or other tissue samples should be collected for molecular genetic studies by competent investigators.

Any reintroductions from zoos should receive prior approval and be well-planned with wildlife ministry biologists; they certainly should be well-documented.

6) **Public education.** There is a need to develop a conservation ethic throughout the country, by schools and NGOs; following conservation education, all native species will be better appreciated, therefore better conserved.

COSTS:

At present, the possibility exists to establish a deer reserve by purchasing land adjacent to the estancia where deer occur. Estimated cost for one estancia in Depto Salto = \$3,000,000.

El Tapado Pampas deer preserve project estimated costs (for two years): Vehicle=\$20,000; Gas, fuel, repairs, tires = \$8,000; fence for repair of current deer pasture fence (to exclude sheep) = \$20,000; Estancia housing (Room & board) = \$7,200; travel for U.S. investigators = \$10,000; municipal per diem for US investigators = \$4,000; hardware (field computers, still cameras, etc.) = \$12,000; supplies = \$2,000; publication costs = \$1200; US investigators' salary costs = \$36,000; guard salary costs = \$12,000; veterinary consultants (includes travel, per diem, supplies = \$15,000; botanical consultants (Urug.) = \$8,000; Total = \$135,400.

2) Conservation interest

Venezuela

1) Data collection

2) Conservation interest

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North America: Status Report and Recommended Conservation Action
 Val Geist, Chris Wemmer, Dale Miquelle, and Dan Wharton

STATUS OF NORTH AMERICAN CERVIDS
 (Mexico, U.S. and Canada)

SPECIES

STATUS

<i>Mazama americana</i> (<i>temama</i> , <i>pandora</i>)	Unknown
<i>Rangifer tarandus</i> (<i>caribou</i> , <i>pearyi</i>)	Endangered
<i>Rangifer tarandus osborni</i>	Vulnerable
<i>Rangifer tarandus</i> (<i>groenlandicus</i> , <i>caboti</i> , <i>terranovae</i>)	Safe
<i>Cervus elaphus canadensis</i>	Safe
<i>Cervus elaphus nannodes</i>	Endangered
<i>Odocoileus virginianus</i> (<i>cousei</i> , <i>ochrourus</i> , <i>macrourus</i> , <i>taurinsulae</i> , <i>toltecus</i> , <i>mexicanus</i> , <i>veraecrucis</i>)	Unknown
<i>Odocoileus virginianus</i> (<i>carminus</i> , <i>virginianus</i> , <i>texanus</i> , <i>mcilhennyi</i> , <i>borealis</i> , <i>dacotensis</i> , <i>hilltonensis</i> , <i>nigribarbus</i> , <i>osceola</i> , <i>seminolus</i> , <i>venatorius</i> , <i>miquihuanensis</i> , <i>oaxacensis</i> , <i>sinaloae</i> , <i>acapulcensis</i> , <i>thomasi</i> , <i>nelsoni</i> , <i>yucatanensis</i>)	Safe
<i>Odocoileus virginianus leucurus</i>	Vulnerable
<i>Odocoileus virginianus clavium</i>	Endangered
<i>Odocoileus hemionus</i> (<i>columbianus</i> , <i>sitkensis</i> , <i>hemionus</i> , <i>eremicus</i> , <i>californicus</i> , <i>fulginatus</i> , <i>crooki</i>)	Safe
<i>Odocoileus hemionus</i> (<i>peninsulae</i> , <i>inyoensis</i> , <i>sheldoni</i>)	Unknown
<i>Odocoileus hemionus cerrosensis</i>	Critical
<i>Alces alces</i> (<i>americana</i> , <i>andersoni</i> , <i>shirasi</i> , <i>gigas</i>)	Safe

Total of 6 species, 52 subspecies (1-critical; 4-endangered; 2-vulnerable; 33-safe; 12-unknown).

Total of _____ countries contain threatened species (LIST COUNTRIES & SPECIES).

COLUMBIAN WHITE-TAILED DEER (*Odocoileus virginianus leucurus*)

Distribution: Western Oregon and Washington - in the North Umpqua River Valley, Douglas County, Oregon, and along the lower Columbia River in Wahkiakum County, Washington, and Clatsop and Columbia Counties, Oregon. There are two separate populations, one referred to as the Roseburg or Douglas County population, and the other as the lower Columbia River population. Altitudinal range is 0-200 meters.

Past Geographical Distribution: Western Washington and Oregon - along the Columbia River from the Columbia Gorge west to the coast, south in Oregon along the Willamette River and tributaries and as far south as the North Umpqua River drainage in Douglas County, Oregon, north in Washington along the Cowlitz River Valley and other tributaries of the Columbia, possibly as far north as Puget Sound (Bailey, 1936; U.S. Fish and Wildlife Service, 1983).

Population Data:

A. *Status in Wild:* Restricted in distribution and abundant.

B. *Estimated numbers in wild:* In Douglas County, Oregon there is an increasing trend with numbers estimated at 3500 - 4000. In the lower Columbia River area, there is an increasing trend with the numbers estimated at 800 - 1000.

Ecology and Reproduction:

A. *Habitat and Food Preferences:* Lower Columbia River: The deer inhabit islands and bottomlands in the Columbia River floodplain. Native vegetation was tideland Sitka spruce (*Picea sitchensis*) and Columbia River delta black cottonwood (*Populus trichocarpa*), willow (*Salix* spp.), and red alder (*Alnus rubra*) forests. Much of the area was diked and cleared for agricultural development in the 1920s and 30s. Suring (1974) and Suring and Vohs (1979) documented habitat preference in one portion of the deer's range. Of the 12 plant communities they identified, deer use was highest in park forest, open canopy forest, sparse rush, and dense thistle. Use of improved pasture was relatively low even though it covered nearly 40% of the study area. Dublin (1980) conducted a food habits study on the Washington mainland. Grasses (*Alopecurus*, *Dactylus*, *Festuca*, *Glyceria*, *Phleum*) comprised 27% to 65% of the monthly diet, but were not preferred at any time of year. Browse was important during the summer, fall, and winter. The principal browse species was evergreen blackberry (*Rubus laciniatus*). Forbs were most heavily utilized in spring, summer, and early fall.

Douglas County (Roseburg), Oregon. Most Columbian white-tails are found within or near riparian areas of the North Umpqua River and its tributaries. They prefer grass-shrub, oak (*Quercus garryana*) - savannah, open oak, closed oak, riparian, and conifer habitats. The oak woodland/grassland ecotone is especially important (Smith, 1981). Grasses include hedgehog dogtail (*Cynosurus echinatus*) and ripgut (*Bromus rigidus*) in unimproved pastures and perennial ryegrass (*Lolium perenne*) and tall fescue (*Festuca arundinacea*) in improved pastures.

B. *Average Group Size and Dispersion Pattern:* Groups are small, with most consisting of one to three deer. On a monthly basis, group size in the lower Columbia River herd ranged from 1.82 in November to 2.54 in September (Gavin et al., 1984). The deer tend to be concentrated around woodlots and are less common in open areas (Gavin et al., 1984; Smith, 1981; Suring and Vohs, 1979).

C. Movements: Lower Columbia River deer are nonmigratory. They tend to be sedentary with mean home ranges being approximately 160 ha for females and 190 ha for males (Gavin et al., 1984). In Douglas County, the deer generally utilize upland oak woodland/grassland areas during winter and spring, and move to lowlands during the summer to be near water (Smith, 1981).

D. Time of Calving: Most calving occurs during early to mid-June (Gavin, 1979; Smith, 1981).

Causes of Decline: The causes are unknown; however, the decline occurred during the period when the region was being settled by pioneers and it is reasonable to speculate that habitat destruction due to land clearing, etc. and overhunting were causative factors (Gavin, 1978).

Native Subsistence Use: N/A

Commercial Uses: There is no known commercial use of this subspecies.

Protected Areas: The Lower Columbia River population is within the Julia Butler Hansen Refuge for the Columbian White-tailed Deer and has a commonly seen population with adequate protection. Geographical coordinates for the refuge are 4615 lat., 12325 long. The Douglas County (Roseburg), Oregon population encompasses more than 45,000 ha, nearly all of which is privately owned.

Conservation Action: The primary need is to secure additional habitat. This can be accomplished through a variety of methods including fee title acquisition, conservation easements, zoning, etc. To be considered secure, habitat must be protected from human activities that would be detrimental to the welfare of the Columbian white-tailed deer. Of course, the habitat must also be suitable and occupied by the deer.

KEY DEER (*Odocoileus virginianus clavium*)

Introduction: The Key deer represents one of the few populations of cervids that is threatened in North America. As such, a Recovery Plan has been developed (U.S. Fish and Wildlife Service 1985), a population viability analysis has been conducted (Seal and Lacy 1990) and considerable information is available on the subspecies (Klimstra 1990, in Seal et al. 1990). Information contained in this review is largely extracted from Hardin et al. (1984), Seal et al. (1990), and Klimstra (1990).

Present Distribution: Key deer are presently restricted to the lower keys. Dickson (1955) reported evidence of deer on 11 keys in 1951-1952, and Klimstra et al. (1974) provided evidence that Key deer probably use most keys from Boca Chica to the Johnson Keys. They have been reported on 26 islands between Spanish Harbor Bridge and Boca Chica (Klimstra et al. 1974, Klimstra unpubl. data). The majority of the population occurs within the boundary of the National Key Deer Refuge.

Past Distribution: It is believed that key deer once ranged from Key West to Duck Key (Barbour and Allen 1922). However, the 9.8 km of open water between Key Vaca and the keys to the west may have been a barrier to western expansion. Therefore, there is some question whether Boot, Grassy, Duck and Vaca keys were ever colonized. The key deer became endemic following a rise in sea level with the retreat of glaciers ending the Wisconsin period of the Pleistocene. (Hoffmeister and Multer 1968).

Population status-past and present: There is little information available to estimate original population size of the Key deer. However, since most of the original land mass was probably covered with mature forests, the carrying capacity for deer was probably low (Hardin et al. 1984). Episodic storms, particularly hurricanes, could have occasionally eliminated large tracts of mature forest, and provided early successional stages that increased forage availability. With the settlement of the Florida Keys in the mid- to late-1800's, clearing of the land no doubt improved habitat conditions for the deer. Although the population may have responded to more favorable conditions, settlement also brought increased hunting pressure and an expanded use of deer as a source of meat. Increased hunting pressure probably continued through the late 1800's and early 1900's, so that by 1930's there had arisen concern that the deer might be eliminated from the Florida Keys. The Florida legislature banned hunting of deer in the Keys in 1939, but there was no attempt to enforce the ban, and by 1950, the population may have been reduced to as few as 25 animals. In 1957, the Key Deer Refuge was established, and in 1967 the subspecies was placed on the federal list of endangered species. In 1974, Klimstra et al. (1974) estimated there were 200-250 deer on Big Pine Key, perhaps 100-150 on 22 other islands, and believed the population was stable. However, by the early 1980's the population had probably declined by 100 to an estimated population of 250-300 individuals (Hardin et al. 1984, Klimstra 1985).

Ecology and Reproduction

A. Habitat and Food Preference: Data from Big Pine Key suggest that a diversity of habitats is important, but that the critical habitat component is available fresh water. Deer will move to keys with permanent fresh water supplies during periods of low rainfall. Many keys appear to have high quality habitat, but due to an absence of freshwater (at least seasonally), these islands are only used seasonally or transiently.

Pinelands and hardwoods are the most commonly used habitats (Silvy 1975). Sites recently burned, cleared, or sparsely developed are preferred because the open habitats provide more palatable, early successional vegetation, and may also often relief from mosquitoes due to higher winds.

As with many other white-tailed deer populations, the Key deer has a catholic diet, as reflected

in identification of 164 plant species being eaten (Dooley 1975). Of this total, 28 species provide the majority (75%) of forage eaten. Woody plants and fruits composed 67% of the diet, palm fruits, flowers and spathe 14%, and forbs 13%. Utilization of forage types varies seasonally: browse is most commonly eaten from December to March, and fruits and flowers from April to November.

B. Reproductive Ecology: Breeding is initiated in September, peaks in October, and declines through November and December. Most births occur between mid-March and mid-May, but observations of spotted fawns in all months demonstrates that the population does not breed on a strictly seasonally basis (Hardin 1974, Hardin et al. 1984). Key deer appear to have one of the lowest reproductive potentials of North American white-tailed deer populations: twinning is rare, precocial breeding (by fawns) is exceptional, and breeding by yearling females is infrequently documented. Males rarely breed until 3 years old. There is a minimum mortality of 20% through the first 6 months of life (Hardin 1974). Males have a survival rate of 50% through the first 1.5 years of life, and no males older than 8 have been recorded. In contrast, females have a survival rate of 50% through 2.5 years, and although most do not survive past 9 years, 2 records of reproductively active females 19 or older have been recorded. Fetal sex ratio was skewed towards males 1.75:1.00, as it was for fawns 2.0:1.0 (Hardin 1974).

Causes of Decline: Six human-related factors have affected population status of Key deer. (1) The initial decline during the late 1800's and early 1900's was almost certainly due to overharvest. Heavy hunting pressure, despite Florida legislature banning hunting, continued into the 1950's. The population apparently recovered through the 1960's and 1970's, but apparently faced another decline in the 1980's. Poaching continues at present, and though the incidence is less, animals that are in close association with people, due to feeding and baiting, are particularly vulnerable. (2) The Key deer appears vulnerable to habitat loss due to commercial land use and subdivision development. Development on Big Pine Key is especially important since this island retains 65-70% of the Key deer population. (3) Collisions with vehicles are another important human impact: approximately 80% of annual mortality is attributed to car collisions. (4) With the increasing human population, domestic dog numbers have also risen. Deer mortality results directly from dog attacks, as well as from pursuit by dogs onto roads or into water, where collisions with cars and drowning occurred. (5) Fawns are vulnerable to drowning in mosquito ditches. Hardin (1974) documented an 18% loss of marked fawns in mosquito ditches. (6) In the past Key deer have been a tourist attraction, and most residents have supported protective measures for the deer. But many people now consider the deer a nuisance animal because they feed on cultivated and ornamental plants.

Two environmental parameters may be important regulating mechanisms. (1) Freshwater is a critical component of the environment. Its availability is primarily dependent upon annual rainfall. Persistence of freshwater is dependent upon elevation (keys less than 3-4 feet above sea level do not retain water), intrusion of salt/brackish water through the subsurface oolitic limestone (due either to tides or dredging of canals), and to the presence of freshwater lenses. Total usable habitat therefore fluctuates seasonally and annually with variation in rainfall. Human developments have an impact through dredging and development of wells. (2) Hurricanes are an infrequent but important environmental parameter. The immediate effect of hurricanes is potentially catastrophic since high mortality could result from storms. However, hurricanes may also provide long-term benefits by opening canopies and allowing development of early successional plant communities.

Two biological parameters may be important in affecting population size. (1) Key deer have a low reproductive potential due to low twinning rates, and the near absence of breeding by females less than 2 years old. Therefore, Key deer cannot be expected to recover from declines as fast as might other white-tailed deer populations. (2) There is no evidence that parasites or disease are problems in Key deer, but the potential for dangerous new diseases increases with the increasing number and variety of domestic animals associated with the increasing human population.

Protected Areas: National Key Deer Refuge, now approximately 3000 ha.

Conservation Actions Taken: (1) The Florida legislature banned hunting in 1939; (2) the National Key Deer Refuge was created in 1957; (3) studies of Key deer were initiated in 1964 by U.S. Fish and Wildlife Service personnel and have continued to present; (4) the Key deer was placed on the federal endangered species list in 1967 with full protection under the Endangered Species Act in 1973, and was listed as threatened by Florida in 1978; (4) following a 6-year research study by Klimstra et al. (1974), a Recovery Plan was written (Klimstra et al. 1980, U.S. Fish and Wildlife Service 1985). The central issues of the Recovery Plan include: habitat acquisition, protection, and maintenance; deer protection; monitoring of deer condition, population, and habitat; experimentation with habitat manipulation; education of the public; and, additional studies of natural history and population dynamics. Only some of the Recovery Plan's recommendations have been implemented. (5) To reduce automobile accidents, speed limits on U.S. 1 has been reduced, and signs warning motorists have been erected. (6) Through collaboration of private, state, and federal interests, a dog pound on Big Pine Key has been established to reduce dog harassment of deer. (7) Efforts to acquire new land have been underway since establishment of the Refuge, but recent efforts have been directed towards those tracts that seem essential. (8) There has been a generalized evaluation of deer condition. (9) Experimentation in habitat manipulation has included: controlled burning since 1969 (expanded in 1978 and most recently extended to keys other than Big Pine); enhancement of water supply by removing accumulated sediment at existing sites and establishment of plastic guzzlers; filling of segments of mosquito ditches to reduce fawn mortality. (10) Education of the public has been aimed at reducing feeding of deer (which increases complaints about deer destruction of ornamental plants) and legislation has been enacted that makes feeding of deer a misdemeanor with up to a \$500 fine. (11) Recent emphasis has been placed on land use planning, with support for selected land acquisition, regulation of commercial and road developments, and protection of critical habitat. Monroe County has developed a Comprehensive Land Use Plan, which could have far-reaching effects.

Conservation Measures Proposed: (1) The full implementation of the Recovery Plan is essential. (2) Recommended acquisitions not yet in public ownership on Big Pine and Big Porch Keys and No Name Key should be made. (3) Efforts should be made to reduce private inholdings that inhibit effective habitat management. (4) Major emphasis should be placed on preservation of wetlands. (5) Effective management of human population growth and land use planning should be implemented. (6) Habitat management through an effective controlled burning program should be established. Pine/palm communities and open grasslands should be managed so that their continuity is ensured. (7) Availability of freshwater should be protected or enhanced through protection of wetlands, installation of guzzlers, and possibly replenishing water on selected keys during drought. (8) The dog control plan must be finalized and implemented. (9) Auto speed constraints must be established on U.S. 1 across all of Big Pine Key, and there must be greater enforcement on all state and feeder roads. Right-of-ways should be managed to reduce their attractiveness to deer and to enhance visibility of deer by motorists. (10) Effective reduction of deer-human interactions can be achieved through an aggressive public education campaign that highlights the negative impacts of treating deer as pets. (11) Monitoring and research must be continued to determine: status of population through road censusing, and possibly line transect counts; age and sex-ratio fluctuations; causes of mortalities; levels of deer use of public and private lands; effective deer and people management practices that can be implemented.

The Population Viability Analysis (Seal et al. 1990) suggests that there is a low probability of population persistence over 100 years, and a small ultimate population size in cases of population survival. The population of 250 is small enough that random fluctuations can cause extinction, and its designation as an Endangered Species seems appropriate. Although the Recovery Plan specifically recommends no establishment of a captive population, recommendations of the population viability analysis include establishment of a captive population to (1) protect from catastrophic losses due to

hurricanes, (2) use in baseline studies of morphological, physiological, and growth studies to assess differences between Key deer and mainland deer, and (3) to use in hybridization studies to investigate possible inbreeding effects.

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PEARY CARIBOU (*Rangifer tarandus pearyi*)

Distribution: Queen Elizabeth Islands (ca. north of 74°N), Canadian High Arctic (those caribou found on the Arctic Islands south of 74°N are transitional forms [*R.t. groenlandicus x pearyi*]). There are no reintroduced populations of Peary caribou. Peary caribou no longer occur on Greenland (Meldgaard, 1986). See also Roby, Thing, & Brink (1984) for transitional forms supposedly on Greenland.

Past Geographic Distribution: Canadian Arctic Archipelago, and possibly on northern Greenland. It appears that after the last great glacial age, ancestral Peary caribou radiated out from their refugium and reoccupied the entire Canadian Arctic Archipelago, except Baffin and Bylot islands. It is likely that some of these progenitors also either migrated to Greenland or originated from a refugium in northern Greenland "Pearyland". Over time, invading barren-ground caribou (*R.t. groenlandicus*) from the Canadian mainland bred with Peary caribou then living on the southern tier of Arctic Islands and produced a transitional form of *Rangifer (groenlandicus x pearyi)*, some favoring *pearyi* more than *groenlandicus* and some vice versa. These transitional forms on the southern tier of Canadian Arctic Islands have been mistakenly lumped with the true Peary caribou now found only on the Queen Elizabeth Islands of the Canadian High Arctic.

Population Data:

A. *Status in the wild:* restricted in distribution and at low density.

B. *Estimated numbers in the wild:* On the Queen Elizabeth Islands (Northwest Territories, Canada) there is a decreasing trend with numbers estimated at 3300-3600. There are no known viable populations of Peary caribou anywhere else in the world at present.

Ecology and Reproduction:

A. *Habitat and Food Preferences:* Icefields, bare ground, and rock restrict the areas of suitable foraging habitat for Peary caribou to a relatively small percentage of the total area of the Queen Elizabeth Islands. Peary caribou use poorly to moderately vegetated xeric to mesic habitats - *Carex* spp.; *Salix* spp.; grasses; forbs, especially *Saxifraga oppositifolia*, *Dryas integrifolia*; and foliose lichens are important forages. Feeding sites are often devoid of vascular plants and even crustose lichens are taken, when snow/ice conditions hinder foraging on better sites.

B. *Average group size and dispersion pattern:* Winter - 3-5 with high proportion of solitaries and pairs. Summer - 5-10 in postcalving period (July-August) often marked differences by island and year, as strongly influenced by overall mean density of caribou at any given time.

C. *Movements:* As for all *Rangifer*, Peary caribou are characterized by their seemingly almost constant movements, many of which involve inter-island movements and seasonal migrations. Tendency for migrations to small islands in spring for calving but also bulls found on small islands in summer. However, most remain on the large islands, sometimes moving from one large island to another.

D. *Time of Calving:* The duration of the calving period is not well documented (F. Miller currently working on it). Most calving appears to take place in mid- to late June, possibly later than for other caribou.

Causes of Decline: Unfavorable winter conditions; the role of man has not been disproven in this matter. Weather records only extend back 40-50 years in the Canadian High Arctic and they are mostly fragmentary and limited. Also, weather collecting stations are extremely widely spaced and many large regional voids exist where no necessarily representative weather data apply. The possible role of anthropogenic climatic change "the greenhouse effect" and pollution and contamination of the arctic environs (air, land, and sea) could have been or will be contributing factors to changes in weather patterns that could or did severely impact on Peary caribou. On the other hand, the drastic decline in number over the past 3 decades could simply be a natural phenomenon.

Native Subsistence Use: There are only two Inuit settlements in the Canadian High Arctic with about 500 people. These Inuit prefer Peary caribou as the staple fresh red meat in their diets. The Peary caribou not only has great economic value for food, clothing, and tourism, but is the very center of the cultural identity of these Inuit. If the populations could be restored, these Inuit would depend heavily on the Peary caribou, as they did in the past. Currently, little hunting occurs on the Queen Elizabeth Islands, but some hunting at low rates should be tolerated to encourage the people to continue to be concerned about the Peary caribou as a valuable renewable resource.

Commercial Uses: Essentially none, except the use of skins and antlers for carving and clothing that is sold to tourists, whenever possible. I have no knowledge of current prices. Most carvings and clothing made from Peary caribou parts are sold opportunistically to tourists on site. Some carvings make their way into southern markets. It appears that the antler trade for raw antlers in velvet has not made its way into the Canadian High Arctic, although it is probably just a matter of time, if someone perceives a supply is there; however, current low densities and the general lack of caribou hunting on Peary caribou range on the Queen Elizabeth Islands will not likely generate such a market. Currently, the meat is not commercially sold, as most all caribou hunting takes place on the southern tier of Arctic Islands where the caribou are often called "Peary caribou", but they are not. Currently, there appears to be no world market for Peary caribou products.

Protected Areas: Currently there are no areas that truly protect Peary caribou per se. Some could eventually offer indirect protection through land use regulations. No management plan exists for the Peary caribou.

Conservation Action: A management plan must be put in place by the Government of the Northwest Territories, Department of Renewable Resources, as they are the responsible management agency. A RENEW Recovery Team for Peary Caribou must be formed with the GNWT DRR as lead agency. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) must recognize Peary caribou on the Queen Elizabeth Islands as unique and different from "arctic island" caribou on the southern tier of Arctic Islands and classify Peary caribou as "Endangered". Peary caribou are currently recognized as "Threatened" by COSEWIC.

Mainland Asia: Status Report and Recommended Conservation Action
 Michael Green, William Oliver, James Dolan, and Roland Wirth

STATUS OF ASIAN CERVIDS

(China, India, Malaysia, Thailand, Burma, Vietnam, Cambodia, Laos, Philippines, Korea, Kashmir, Taiwan, Tibet, Japan)

SPECIES	STATUS
<i>Moschus berezovskii</i> (<i>berezovskii</i> , <i>anhuiensis</i>)	Endangered
<i>Moschus berezovskii caobangis</i>	Critical
<i>Moschus fuscus</i> spp.	Vulnerable
<i>Moschus fuscus fuscus</i>	Endangered
<i>Moschus chrysogaster</i> spp.	Endangered
<i>Moschus chrysogaster</i> (<i>chrysogaster</i> , <i>sifanicus</i> , <i>cupreus</i> , <i>leucogaster</i>)	Endangered
<i>Moschus moschiferus</i> (<i>parvipes</i> , <i>sachalinensis</i>)	Endangered
<i>Alces alces</i> (<i>alces</i> , <i>buturlini</i> , <i>pfizenmayeri</i>)	Safe
<i>Alces alces cameloides</i>	Vulnerable
<i>Axis kuhli</i>	Critical
<i>Axis calamianensis calamianensis</i>	Endangered
<i>Axis porcinus porcinus</i>	Vulnerable
<i>Axis porcinus annamiticus</i>	Unknown
<i>Axis axis</i>	Safe
<i>Capreolus pygargus</i> (<i>pygargus</i> , <i>tianchanicus</i> , <i>bedfordi</i>)	Safe
<i>Capreolus pygargus</i> spp.	Unknown
<i>Cervus albirostris albirostris</i>	Endangered
<i>Cervus unicolor equinus</i>	Critical
<i>Cervus unicolor swinhoi</i>	Endangered
<i>Cervus duvauceli branderi</i>	Critical
<i>Cervus duvauceli</i> (<i>ranjitsinhi</i> , <i>duvauceli</i>)	Endangered
<i>Cervus eldi</i>	Critical
<i>Cervus eldi eldi</i>	Critical
<i>Cervus eldi siamensis</i>	Endangered
<i>Cervus eldi thamin</i>	Vulnerable
<i>Cervus marianus</i> (<i>barandanus</i> , <i>nigricans</i>)	Endangered
<i>Cervus mariannus bonensis</i>	Unknown
<i>Cervus nippon</i> (<i>mandarinus</i> , <i>sichuanicus</i> , <i>taiouanus</i> , <i>pseudaxis</i> , <i>keramae</i> , <i>kopschi</i>)	Critical
<i>Cervus nippon</i> (<i>yesoensis</i> , <i>mantchuricus</i> , <i>pulchellus</i>)	Vulnerable
<i>Cervus nippon</i> (<i>grassianus</i> , <i>aplodontus</i>)	Unknown
<i>Cervus nippon nippon</i>	Safe
<i>Cervus elaphus</i> (<i>hanglu</i> , <i>wallichi</i> , <i>affinis</i>)	Critical
<i>Cervus elaphus</i> (<i>macneilli</i> , <i>bactrianus</i> , <i>yarkandensis</i>)	Endangered
<i>Cervus elaphus</i> (<i>kansuensis</i> , <i>xanthopygus</i> , <i>sibiricus</i>)	Safe
<i>Cervus elaphus songaricus</i>	Vulnerable
<i>Cervus elaphus alashanicus</i>	Unknown
<i>Cervus unicolor</i> (<i>unicolor</i> , <i>cambojensis</i> , <i>equinus</i>)	Safe
<i>Cervus unicolor dejeani</i>	Vulnerable
<i>Cervus unicolor hainana</i>	Unknown
<i>Cervus unicolor swinhoi</i>	Endangered
<i>Elaphodus cephalophus</i> (<i>cephalophus</i> , <i>michianus</i> , <i>ichangensis</i> , <i>fociensus</i>)	Vulnerable
<i>Elaphurus davidianus davidianus</i>	Endangered
<i>Hydropotes inermis inermis</i>	Vulnerable
<i>Hydropotes inermis argyropus</i>	Unknown
<i>Muntiacus crinifrons</i>	Critical
<i>Muntiacus feai feai</i>	Endangered
<i>Muntiacus feai rooseveltorum</i>	Unknown
<i>Muntiacus gongshanus</i>	Endangered
<i>Muntiacus muntjak</i> (<i>muntjak</i> , <i>vaginalis</i> , <i>aureus</i> , <i>malabaricus</i> , <i>curvostylis</i> , <i>anamensis</i>)	Safe
<i>Muntiacus muntjak</i> (<i>menglalis</i> , <i>yunnanensis</i>)	Unknown
<i>Muntiacus reevesi reevesi</i>	Safe
<i>Muntiacus reevesi micrurus</i>	Vulnerable
<i>Rangifer tarandus</i> (<i>valantinae</i> , <i>angustrostris</i> , <i>phylurchus</i>)	Unknown

SIKA (*Cervus nippon sichuanicus*)

Distribution: 102.38° - 103.08°E and 33.58° - 34.11°.

Past Distribution: Unknown.

Population Data:

A. Status in Wild: restricted in distribution and at low density (413 animals/170 Km² [1987 data]).

B. Estimated numbers in wild: In Ruoergai, Sichuan Province there is a stable population with numbers estimated at 413.

Ecology and Reproduction:

A. Habitat and Food Preference:

B. Average group size and dispersion pattern: From May-July (solitary individuals); from Sept.-March (aggregation/herds); from May-Aug. (base group of 2-12); from June-Aug. (mother/young groups of 2-3 individuals); August (adult male groups of 2-4 individuals).

C. Movements:

D. Time of calving: from the latter part of May to the latter part of July, with a peak of June.

Causes of Decline:

Native Subsistence Use: Before the establishment of the nature reserve in 1964, the deer were hunted by the local people for the meat and the pilose antler of young stags.

Commercial Uses: Now under protection.

Protected Areas: Tiebu Nature Reserve where the population is commonly seen and the protection is adequate.

Conservation Action: The reserve should be larger than its present 20,000 ha so that the population would not be restricted. The deer that leave the reserve are killed by local people.

KERAMA SIKA DEER (*Cervus nippon keramae*)

Distribution: Although it is probably introduced, the Kerama sika is a highly distinct form of small body size and dark pelage colour. It formerly occurred on many islands in the Kerama Shoto (archipelago), but is now extinct on all islands except Yakabi jima, Zamami jima, Aka jima and Geruma jima. A survey conducted in the late 1970's indicated that even these populations had been reduced to extremely low numbers, i. e. about 30 on Yakabi jima, 5 on Zamami jima, 10 on Aka jima and 5 Geruma jima. More recent status data is lacking, but there is no doubt that this animal is critically endangered, if it still survives. As far as is known there are no animals in captivity at the present time following the recent loss of a herd maintained by the Zoological Society of London since the 1930's. The animal has been designated as a 'Natural Monument' in Japan since 1972.

THREATS:

- extremely small and fragmented, non-viable populations
- the available habitat is suboptimal on all islands, especially Yakabi jima (i. e. very rugged terrain, intersected by steep cliffs, and predominance of bamboos and pampas grasses not favoured by the deer)
- drought (there are few rivers or other permanent water sources on any of the islands) and the available water on Yakabi jima is polluted by heavy metal ions
- all populations highly inbred
- predation by introduced predators (dogs and cats)
- hostility amongst local people towards enhanced conservation
- potential risk of increased disturbance following development of neighbouring islands

PRESCRIBED MANAGMENT ACTION:

1. Conduct status survey of all islands with a view to the initiation of immediate, short-term protective measures for any surviving populations. \$ 15,000
2. Conduct attitude survey amongst local people to determine means of instituting acceptable long-term protective measures and develop conservation education programme pertaining to the Ryukyu region as a whole. \$ 5,000
3. Assess and implement mangement plan recommendations for habitat restoration/improvement, including removal of course grasses and replacement with broad-leaved trees, creation of waterholes, predator control programme, etc. \$ 25,000
4. Assess and implement options for early or immediate development of a properly structured captive breeding programme, using animals from any (or all surviving populations ?); if possible, whilst also assessing the genetic differences between these populations. \$ 40,000

FOREST MUSK DEER (*Moschus berezovskii berezovskii*)

Distribution: Ninxia, Hubei, Sichuan, Guizhou, Xizang (Tibet), and Shaanxi are main distribution areas.

Past Distribution:

Population Data:

A. *Status in wild:* Widespread and at low density.

B. *Estimated numbers in the wild:* In the 1980s China had a population of 200,000 - 300,000 but the population has decreased with numbers estimated at 100,000.

C. *Captive Populations:* Prof. Sheng Helin with the East China Normal University has a captive herd of 15 (6:9) in Chongmin, Shanghai; there is another herd at the Ma Er Kang Musk Deer Farm in Guanxian County, Sichuan Province - owner is unknown.

Ecology and Reproduction:

A. *Habitat and Food Preference:*

B. *Average group size and dispersion pattern:* Solitary

C. *Movements:*

D. *Time of Calving:* June

Causes of Decline: Illegal hunting.

Native Subsistence Use: musk as a high value product.

Commercial Uses:

Protected Areas: There are no special protected areas for musk deer, however all nature reserves for Giant Panda are including musk deer (Wolong Nature Reserve, Tangjiahe Nature Reserve, etc.). The populations are rarely seen and protection is not adequate.

BLACK MUNTJAC (*Muntiacus crinifrons crinifrons*)

Distribution: Western Zhejiang, southern Anhui and adjacent regions.

Past Distribution: Extended to coastal area of Ningbo, Zhejiang Province.

Population Data:

A. *Status in Wild:* Widespread and at low density.

B. *Estimated numbers in wild:* In the 70s there were about 5,000-6,000 animals; in the 80s they were under 5,000.

Ecology and Reproduction:

A. *Habitat and Food Preference:*

B. *Average group size and dispersion pattern:* solitary animal.

C. *Movements:* seasonal vertical movement.

D. *Time of calving:* none - seasonal breeding.

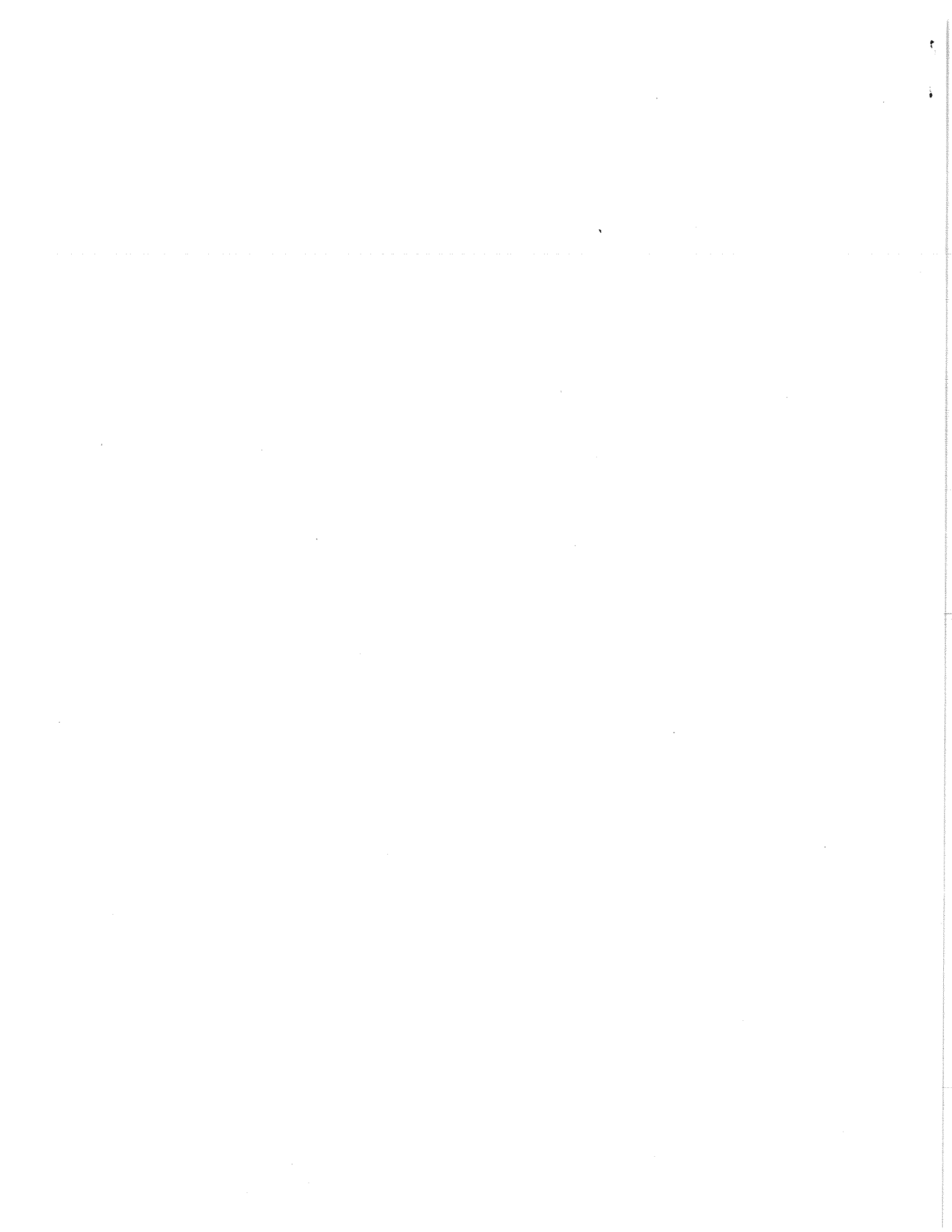
Causes of Decline: Illegal hunting.

Native Subsistence Use: Hunted for venison and skin.

Commercial Uses:

Protected Areas: No special protected areas for the species, but their range is included in existing nature reserves such as Jiulongshan Nature Reserve. Protection is not adequate.

Conservation Action: Captive populations need to be set up. Though there were a few animals kept in zoos and some farms, they have not reproduced.



SWAMP DEER, BARASINGHA (*Cervus duvauceli duvauceli* [Indian & Nepal], *C.d. branderi* [India], and *C.d. ranjitsinhi* [India])

Distribution: See map _____. No reintroductions known. Altitudinal range is up to about 500 m.

Past Distribution: North India west to Indus Valley, north Indian gangetic plain (including the west portion of the southern Nepalese lowlands as well as the Chitwan Valley), east to Assam and south to the Ganges delta (Sunderbans); east Central India south to Godavari River. Ref. Schaller, 1967; Martin, 1975.

Population Data:

A. Status in the Wild: Restricted in distribution and abundant and at low density, depending on location.

B. Estimated Numbers in the Wild: Nepal - At the Sukla Phanta Reserve in southwest Nepal, there is a population estimated at 4,000 and increasing; at the Karnali-Bardia National Park, in south central Nepal, there is a small population of about 55 that is increasing.

India - At the Dudhwa National Park in north Central India there is a population estimated at 1,200 - 1,500 (1976) with an unknown trend, but said to have declined; at the Kaziranga National Park in northeast India (Assam) there is a population of about 500 with an unknown trend; and at the Kanha National Park in east central India (Madhya Pradesh) there is a population of less than 300 with an unknown trend.

C. Captive Populations: No information.

Ecology and Reproduction:

A. Habitat and Food Preference: Animals of grasslands and open forest with a grassy understory, usually dominated by sal (*Shorea robusta*) trees. In northern part of range occupy seasonally flooded terrain with dense grasses reaching 5-6 m tall. In Central India (Kanha) habitat is much drier. Almost exclusively grazers, but have been observed standing in water and plunging faces beneath the surface to feed on aquatic plants.

B. Average group size and dispersion pattern: Varies greatly with season. In general, tend to be most dispersed in wet season, when grasses are long, and aggregate in dry season where grasses are short, especially in response to new growth after a fire. In Sukla Phanta reporter has seen up to 900 animals in one "herd" on new grass.

C. Movements: Move seasonally within reserves in response to best grazing, and possibly with respect to drinking water supply. In southwest Nepal, and in north central India, males tend to aggregate within large herds in winter, but because observations are difficult when grass is long, cannot say with precision what happens at other times of year.

D. Time of Calving: May to July in Nepal and north central India. See also Schaller, 1967; Martin, 1975.

Causes of Decline: Human population pressure causes reduction of available habitat, which is often

good potential farmland. Poaching is also a factor, e.g., this was the case in Sukla Phata in 1974-76. Other forms of disturbance, and in some cases gradual habitat decline may be occasioned by grass and timber cutting (some legal, some not), firewood gathering, illegal grazing in reserves, and gathering of other wild resources and foods by local people.

Native Subsistence Use: Apart from local people eating the meat, which is said not to be highly prized, reporter has no information. See also Holloway, 1973.

Commercial Uses: Reporter has no information, but believes that trade would be only local, and primarily for meat, possibly also hard antlers.

Protected Areas: Protected areas are all population locations listed above. Populations are commonly to occasionally seen in all cases. Protection is probably not adequate, with the possible exception being the Kanha National Park. Laws tend to exist on the books, but through a combination of lack of resources and indifference, they may be poorly enforced.

Conservation Measures for the Species: If it has not already been done, there needs to be a range-wide survey of the species to estimate numbers, document trends, and assess the state of the available habitat. Depending on current conditions in the various locations, protection of parks and reserves needs to be enforced. Need to look into a multiple use approach to conservation, whereby locals would benefit from reserves, and need to reinforce this with local education programs.

General Comments: In recent years, Sukla Phanta has been increased from about 60 sq. km. to some 300 sq. km. in size, and the barasingha are said to have increased from between 900-1,200 in 1976 to 4,000 (T. Maski, *in litt.*, 1989). Reporter does not know whether this figure represents an actual count or a "data-free" estimate. If it is nearly accurate, it probably means that Sukla Phanta contains the largest barasingha population by far, and that the wild population of barasingha may have almost doubled since the late 70s (depending on the extent of the decline in Dudhwa). In the same time period the Karnali-Bardia deer increased from about 20 to 55, not much at all. In Sukla Phanta, various forms of human incursion and poaching were serious problems in 1974-76. Reporter does not know how the situation has changed in the interim.

Schaller (1967), writing about the north Indian state of Uttar Pradesh, cited 11 areas, including Dudhwa, where barasingha were known to occur. Not all were parks or reserves. Seven years later, Holloway (1973) noted that eight of these could be struck from the list for all practical purposes. Although barasingha occurred in places other than the five Indian and Nepalese reserves and parks mentioned above, it is difficult to say what their status might be in such ungazetted areas today, but the outlook does not seem bright (see also Schaaf and Singh, 1977). In 1977, there were about 280 barasingha in Kanha, and the population had increased markedly under protection and with habitat management (Panwar, 1978). I do not know what the status of the species is there now. The same applies to Kaziranga. The figure the reporter has for this park (about 500) is some 15 years out of date. Indian authorities have not responded to requests for updated information.

MANIPUR BROW-ANTLERED DEER (*Cervus eldi eldi*)

The Manipur brow-antlered deer (*Cervus eldi eldi*) is probably the most endangered deer in the world. It also utilises a most unusual habitat, a mass of floating vegetation known as 'pumdi', and it has by far the smallest range of any free-ranging cervid taxon.

By the early 1970's the sole remaining wild population of *C. e. eldi* had been reduced to only 14 animals in the Keibul Lamjao National Park, an area of only 14 sq. km, of which the deer occupied only approx. 9 sq. km. Much of the available habitat in Keibul Lamjao is almost certainly sub-optimal, which may account for the fact that their range in this area has not expanded over the past 20 years, even though their numbers had increased to approximately 80 individuals in 1990. However, censuses conducted at intervals during the ten years have revealed that population numbers have fluctuated between 50 and 100 individuals, indicating population instability and a low carrying capacity for the area, though there is doubt about the accuracy of some counts. In any event, this precarious status of this population, manifest by its extremely small size, highly restricted range and possible inbreeding depression, is further jeopardised by opposing claims on its remaining habitat (for agricultural development), occasional poaching, flooding, deterioration of water quality and management of Lake Logtak, and the inherent risk of disease transmission through contact with domestic herbivores.

In the late 1950's and early 1960's a captive breeding programme was initiated at the Alipore Zoo, Calcutta, and the National Zoo, New Delhi, though this was based on only one pair of wild-caught animals in each of these institutions. Unfortunately, no additional founders have been acquired since that time, the two existing lines have been continuously in-bred owing to poor cooperation: only one small mixed-line herd has been established. The captive population is therefore chronically in-bred and the demographic management of these animals has been negligible. As a result, there have also been unacceptably high levels of mortality through aggression and disease. From a peak of >100 individuals in the mid-1980's, the captive population had declined to about 90 individuals in 1990.

THREATS:

Existing wild population of questionable viability.

Possibility of significant increase or extension of existing wild population doubtful or non-existent.

Deterioration of available habitat.

Opposing claims for parts of the national park for agricultural development.

Poaching (albeit at relatively low levels).

Inbreeding (wild and captive populations).

Competition with domestic herbivores.

Disease (captive and wild populations).

Poor genetic, demographic and routine management of captive population.

PRESCRIBED MANAGEMENT ACTION

1. Develop and implement management plan for Keibul Lamjao National Park. Priority should be given to assuring the long-term future protection of this area, studies of habitat utilisation, ecology and population biology of the remnant deer population, improvement in habitat quality (including management of Lake Logtak); investigate options for possible genetic and demographic management of the existing population with a view to maintaining maximum genetic heterozygosity; assess health status of wild population, and institute measures to exclude future contact with domestic livestock, etc.:

\$80,000

2. Assess and implement options for sustained or alternative income/resources for any local people currently dependant on the National Park:

\$50,000

3. Increase conservation awareness and patrimony amongst local people by means of an education programme. Elements should include production of posters, T-shirts and other educational materials featuring this species, and visits to all villages in the environs of the national park:

\$15,000

4. Support establishment of a second wild population outside the species' original range. In acknowledging that there is no suitable alternative habitat remaining within the known former range of this species, an introduction of captive-bred (or translocated wild ?) stock is justified in view of the precarious status of both the existing wild and captive populations. Any such introduction should be undertaken in an area closely resembling the natural habitat of this species, where ecologically analogous species (e.g. *C. duvauceli*) are absent. In the event that captive-bred animals are used, only animals free of Bovine Tb. should be released. The presently proposed project in Pobitara Wildlife Sanctuary is potentially suitable, excepting for the large enclosure, which serves no useful purpose and may be hazardous in the event of catastrophe (i.e. only a series of small holding/quarantine enclosures are required), and the absence of a proper screening procedure against the release of diseased stock. Costs to include pre-release site surveys, animal quarantine, repeated Tb. screening, transport and crate costs, construction of temporary holding facilities, post-release monitoring equipment and personnel:

\$150,000

5. Development of a properly structured, cooperative breeding programme. Priorities should include the marking of all individuals and establishment of an official studbook, PVA, development of agreed management protocol for exchange of genetically valuable stock and the proper social and demographic management of all existing captive stocks, improved health care and screening, etc. Costs to include PVA Workshop, provision of essential equipment, consultancy charges (Indian nationals), etc.:

\$50,000

VIETNAMESE SIKA DEER (*Cervus nippon pseudaxis*)

BACKGROUND INFORMATION:

Cervus nippon pseudaxis, the southernmost subspecies of sika deer is extinct in the wild. The taxon was originally attributed to Java, where it has never occurred, and its true range was not established until Jean Delacour discovered it in Indochina in the 1930's. It became extinct in the wild during the second half of this century probably due to over exploitation.

Fortunately, Delacour had also exported a small number of animals to France, and their descendants, together with four locally-bred captives of imported imported by the Berlin Zoo in the early 1960's, constitute the basis of the present captive stock outside Vietnam. In Vietnam there is a captive population of about 50 animals at Cuc Phuong National Park, where they are being held for possible reintroduction; the latter depending on more effective protection of the park and availability of financial resources. In addition there are reports of up to 3000 *C. n. pseudaxis* on farms, though the genetic purity of all of these animals requires investigation.

THREATS: - extinct in the wild

- hybridization of captive population
- lack of coordinated management
- inbreeding
- lack of trained personnel at reintroduction site
- poaching at reintroduction site
- habitat degradation at reintroduction site

PRESCRIBED MANAGEMENT ACTION

1. Collect blood samples from animals at Cuc Phuong and from deer farms
2. Establish purity and relatedness of all ex situ animals
3. Establish studbook
4. Establish a cooperative management protocol
5. Maximize captive population and add additional founders from Vietnam
6. Provide training for Vietnamese personnel
7. Provide funding for more effective protection of Cuc Phuong National Park
8. Provide funding for pre-release facilities
9. Study animal-habitat relationship at the proposed release site
10. Post release monitoring by radio-telemetry

FUNDING REQUIREMENTS:

Phase 1:

- | | |
|---|----------|
| a. travel allowance for principal investigators to collect blood samples and survey for 4 weeks | \$ 3,000 |
| b. 4 week per diem (30 x \$ 50) | \$ 1,500 |
| c. capture drugs and equipment | \$ 2,000 |
| d. 20 crates (per \$ 200) | \$ 4,000 |
| e. transportation of 20 animals from Vietnam to Europe | \$ 9,000 |

Phase 2: a. Four months training for one Vietnamese scientist abroad plus one round-trip airfare

\$ 20,000

- b. Training course for park personnel in Cuc Phuong

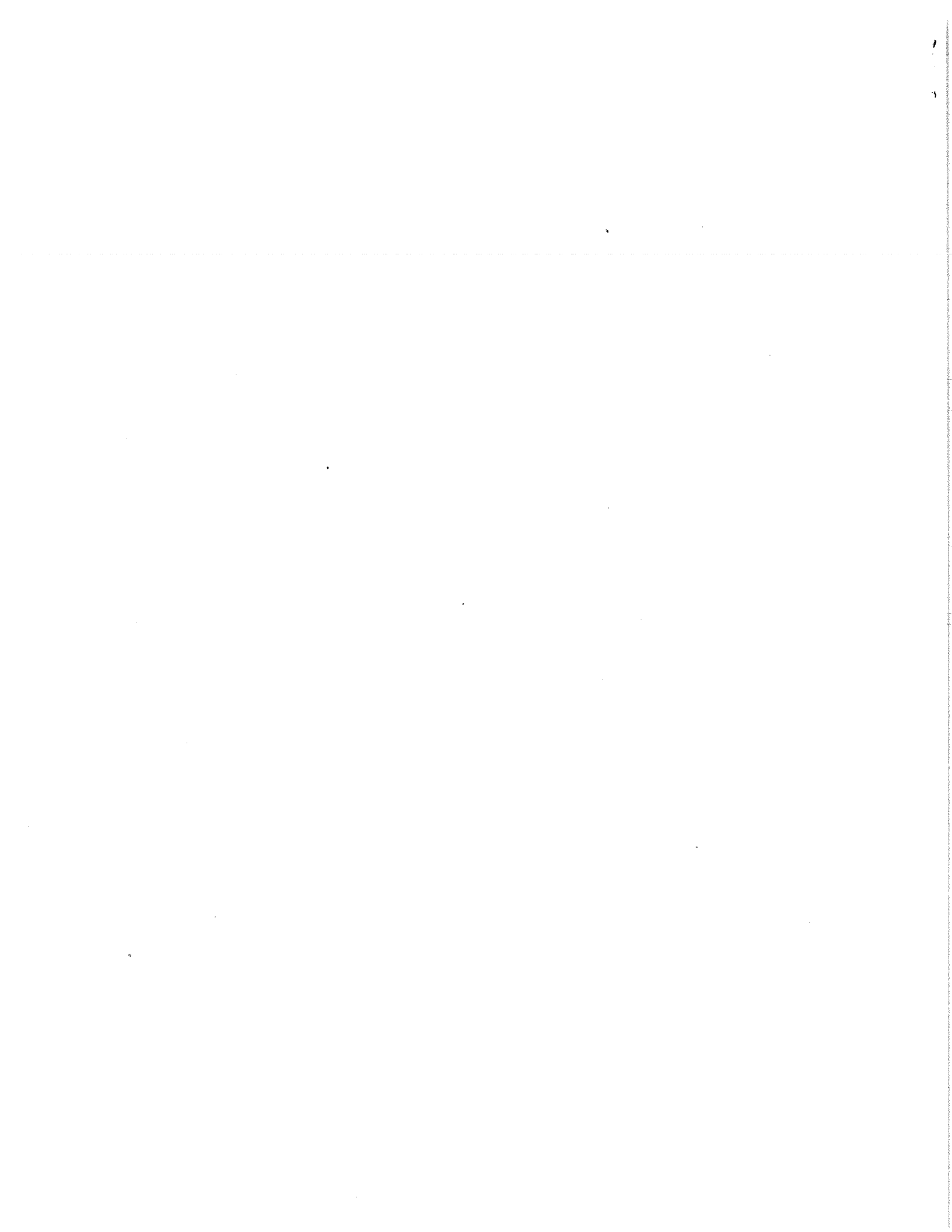
\$ 12,000

c. Expenses for project supervisor
for three years (3x3 months) \$ 30,000

d. Improvement of park protection
(ranger posts, vehicles, equipment) \$ 50,000

e. Construction and maintance of pre-
release facilities \$ 20,000

Phase 3: a. Pre- and post-release studies;
the latter for at least 2 years.
Costs to include radio-telemetry
equipment, salary, miscellaneous
materials: \$ 20,000



BAWEAN DEER (*Axis kuhli*)

BACKGROUND:

As its name suggests, the Bawean deer, *A. kuhli*, is known only from the tiny island of Bawean, off N. E. Java (? ha ?). It is a relatively small, monotypic form, which is believed relatively secure following the creation of the Bawean Island Nature Reserve (? ha ?) in (?) 1979. However, the island has a relatively high and expanding human population, which will inevitably put pressure on the Reserve in the future. Hunting is not currently believed to be a problem but, given the small size of the deer population (>500 individuals), the species must be considered at high risk of extinction from stochastic events, including disease and natural catastrophes.

A captive population, currently (1991) comprising about 100 individuals at Surabaya Zoo, and 30-40 individuals in 4 other collections, represents a potentially valuable contribution to the survival prospects of this species, though this is derived from only a very small number of founders.

THREATS:

Although this species is believed to be relatively secure at present, the extremely small and geographically highly restricted population must give cause for concern. Potential threats to this population may therefore be identified as follows:

Increasing pressure on the Bawean Is. Nature Reserve by expanding human population.

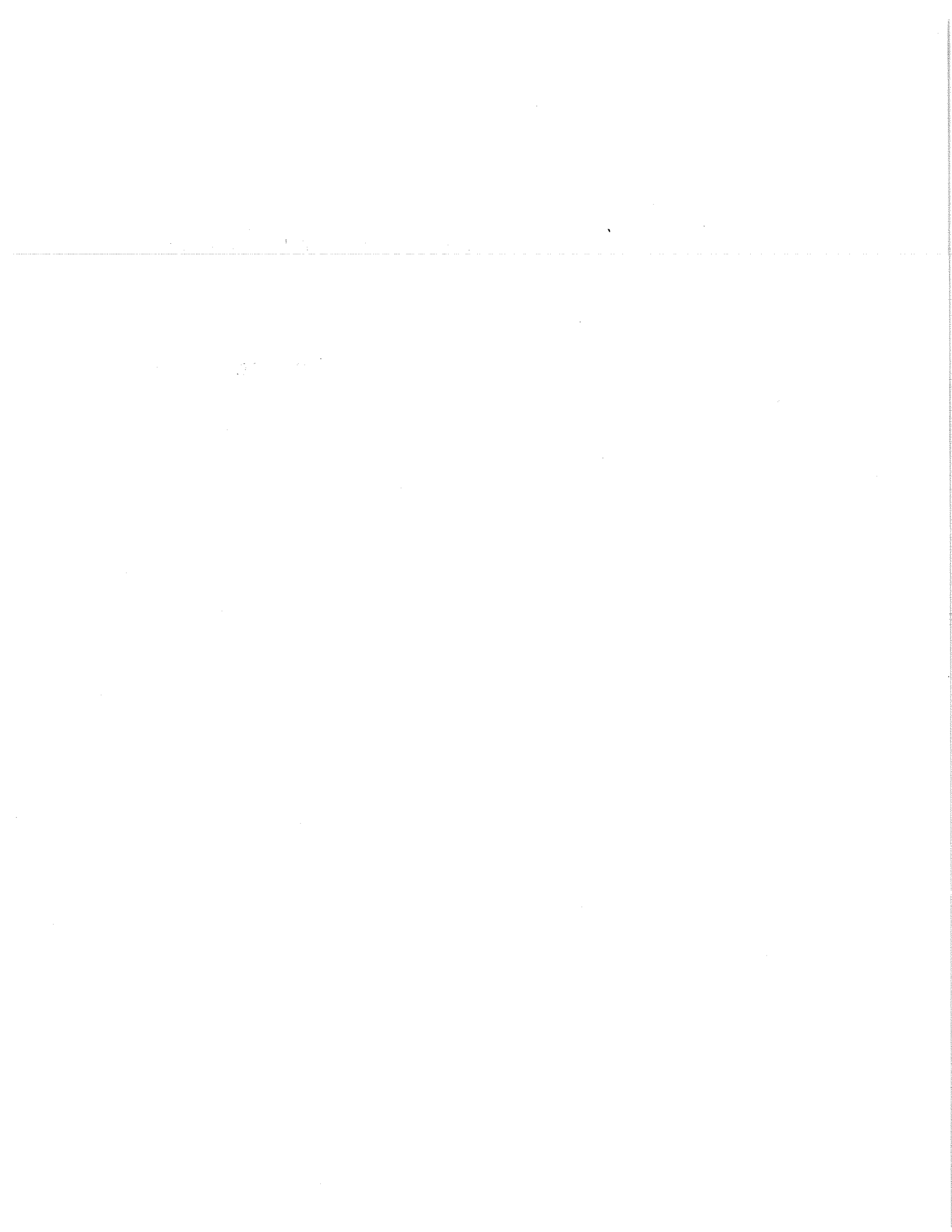
Poaching.

Virulent disease or other stochastic events.

Inbreeding depression in the event of population decline or deep fluctuation troughs.

PRESCRIBED MANAGEMENT ACTION:

1. Re-assess population status and possible future management requirements:
\$5,000.
2. Conduct longer-term (>2yrs) field studies of the species' behaviour, ecology and habitat utilisation:
\$20,000.
3. Conduct questionnaire survey amongst local population of their attitudes towards conservation, and design and implement appropriate conservation education campaign focussing on patrimonial aspects:
\$6,000.
4. Assess genetic and demographic structure of existing captive population, initiate development of studbook and coordinated breeding programme, and obtain 5-10 additional founders:
\$15,000.



PHILIPPINE SPOTTED DEER (*Cervus alfredi*)

BACKGROUND INFORMATION:

The Philippine spotted deer, *Cervus alfredi*, is a highly distinct, monotypic species, endemic to the (West) Visayan Islands, central Philippines. Collectively, these islands comprise the 'Negros Faunal Region', one of the five (and arguably the most important) centres of endemism in the archipelago. The species formerly occurred on all of the larger islands in this group, i.e. Masbate, Cebu, Negros, Guimaras and Panay, but a field survey conducted in 1985 revealed that it had already been exterminated in over 95% of its original range, including all of Masbate, Cebu and Guimaras. The species is therefore known to survive in only one small area of west Panay, and in a few scattered fragments of remaining forest on Negros. Unsubstantiated reports of its occurrence on Samar, Leyte and (formerly) Bohol have also been received, but all of these islands constitute part of the neighbouring 'Mindanao Faunal Region', so it seems unlikely that the species could occur there, at least as a native form.

In line with the priority recommendations arising from the 1985 survey, an area of 40,000 ha of forest in the vicinity of Mt. Baloy/Mt. Madja-as in west Panay has been proposed as a new national park, the Panay Mts. National Park, to protect the largest remaining population of this species. A preliminary faunal survey and management plan for this area was completed in 1987, though the new Park has still not been officially gazetted. In 1990, an international cooperative breeding programme was initiated under the aegis of the first-ever 'Philippines Wildlife Loan Agreement', and two *in-situ* (one each on Panay and Negros) and one *ex-situ* (at Mulhouse Zoo, France) captive herds were established.

THREATS: Some subpopulations of questionable viability

- Habitat loss
- Poaching (subsistence and recreational)
- Inadequate protected area system
- Lack of trained manpower
- Lack of conservation ethic
- Hybridisation
- Human disturbance
- Lack of data from some localities/islands
- Ecological data lacking

PRESCRIBED MANAGEMENT ACTION:

1) Establish (proposed) Panay Mountains National Park and implement agreed park management recommendations (including access and patrol roads, guard posts, interpretation centre, essential equipment, development of agroforestry initiative in buffer zone, tree planting, etc.)

\$ 250,000

2) Develop management plan for Mount Canlaon National Park on Negros

\$ 10,000

3) Explore options for protection of other remnant populations on Negros, including Mt. Talinis/Balinsasayao area of S.E. Negros

\$ 10,000

- 4) Conduct field/status surveys in selected areas, including Masbate, Bohol, Samar and Leyte
\$ 4,000
- 5) Extend existing facilities for captive populations
\$ 10,000
- 6) Obtain up to 12 additional founders for captive 'world herd'
\$ 20,000
- 7) Provide training for relevant park and animal managers (e.g. comprising 4 instructors/25 students over 3 week period, incl. travel and per diem costs)
\$ 60,000
- 8) Develop conservation education programme with particular reference to local people, students, decision makers, military and other armed forces
\$ 15,000
- 9) Improve monitoring and control of illegal captures and movements of all species of deer within the Philippines and investigate instances of introductions and assess status of privately-held captive stocks
\$ 10,000
- 10) Assess genetic differences between insular populations, especially (or only ?) Panay and Negros \$
5,000
- 11) Initiate short and longer term studies of the species' biology and habitat utilisation, both in the wild and captivity
\$ 30,000

BACKGROUND INFORMATION:

The Calamian deer is a small-bodied isolated and monotypic form known only from two of the (three) larger Calamian Islands of Busuanga and Culion, and (formerly ?) some of the smaller intervening islands. As with the closely-related Bawean deer (*A. kuhli*), this species is possibly a Pleistocene relict population.

Available distribution and status data is based on the 1975 field survey by Ian Grimwood, at which time the species was thought to have disappeared from the smaller islands and to have been reduced to a few isolated forest patches on Busuanga. It remained relatively widely distributed on Culion, but human settlement, agricultural expansion and continued (possibly intense) hunting pressure over the past 15 years is likely to have resulted in a considerable reduction in the numbers and range of this population. The species also occurs in the Calautit Island Game Preserve and Wildlife Sanctuary, which comprises a large part of Calautit Island, off N.W. Busuanga. A total of 30 Calamian deer were released in this Reserve in 1977, where the population is reported to have increased to between 100 and 300 individuals according to recent estimates. However, the Game Reserve also supports a large population of African ungulates, including giraffe, zebra and various antelopes, which undoubtedly compete with the native fauna.

THREATS:

Increasingly reduced and fragmented range, with high probability of many (or most ?) subpopulations of doubtful viability (total world population less than 500)

Lack of protected areas within natural range.

Hunting pressure (primarily subsistence) on both main islands.

Competition with exotic livestock (Calautit Is.).

Absence of recent status data and any information on population biology, ecology and management requirements.

PRESCRIBED MANAGEMENT ACTION:

1. Conduct repeat field status survey (all islands), action to include assessment of hunting pressure and other threats, and attitude survey amongst human population: \$8,000
2. Population census on Calautit Is. and technical evaluation of present management regime (incl. needs of native versus exotic species): \$2,000
3. Technical evaluation of existing Calamian deer 'stock-farming' project at the University of the Philippines at Los Banos (UPLB) with a view to the alternative use of these animals (17 individuals in 1990) as a basis for the development of a properly structured collaborative breeding programme: \$2,000

Europe and the Near East: Status Report and Recommended Conservation Action
Georg Schwede and Jim Dolan

STATUS OF EUROPEAN AND NEAR EAST CERVIDS
(Europe west to the Urals, North Africa, the Middle East, Near East, Central Asia, and the Philippines)

<u>SPECIES</u>	<u>STATUS</u>
<i>Alces alces alces</i>	Safe
<i>Axis kuhli</i>	Critical
<i>Axis kuhli calamiensis</i>	Critical
<i>Capreolus capreolus</i> spp.	Critical
<i>Capreolus capreolus (capreolus, coxi)</i>	Safe
<i>Cervus alfredi</i>	Critical
<i>Cervus elaphus (elaphus, hippelaphus, atlanticus, montanus, scoticus, maral)</i>	Safe
<i>Cervus elaphus (corsicanus, hispanicus, barbarus, bactrianus)</i>	Endangered
<i>Cervus mariannus (mariannus, nigellus)</i>	Vulnerable
<i>Cervus mariannus (barandanus, nigricans)</i>	Endangered
<i>Cervus nippon soloensis</i>	Unknown
<i>Cervus timorensis russa</i>	Safe
<i>Cervus timorensis (renschii, floresiensis, timorensis, macassaricus, djonga, moluccensis)</i>	Unknown
<i>Cervus unicolor brookei</i>	Unknown
<i>Dama dama dama</i>	Endangered
<i>Dama dama mesopotamica</i>	Critical
<i>Muntiacus atherodes</i>	Safe
<i>Muntiacus muntjak montanus</i>	Vulnerable
<i>Rangifer tarandus (tarandus, platyrhincus)</i>	Safe
<i>Rangifer tarandus fennicus</i>	Vulnerable

Total of 13 species, 33 subspecies (5-critical; 7-endangered; 4-vulnerable; 13-safe; 8-unknown)

Total of _____ countries contain threatened species (LIST COUNTRIES & SPECIES)



DRAFT

POSITION STATEMENTS OF THE DEER SPECIALIST GROUP

Introductions of Alien Wildlife

For better or worse (and usually worse), colonizing man has created familiarity by liberating alien wildlife in the new land. The list of species is great, and deer figure prominently, particularly during the last century. In retrospect, the ecological costs have exceeded the immediate benefits. The CBSG statement on Genetic Management Considerations for Threatened Species (1991) lists the following potential hazards of ill-conceived translocations of individuals:

1. Homogenization of the genetic composition of populations through decay of between population differences;
2. Blurring or irretrievable loss of genetic information on the intraspecific evolutionary histories of populations;
3. Placement in jeopardy or outright destruction of local adaptations, through introduction of foreign genetic material, breakup of coadapted gene complexes, or genetic swamping;
4. Creation of reproductive difficulties when transplanted individuals differ from recipients in karyotype or other genetic characteristics that may decrease fitness of intercross progeny or their descendants;
5. Disruption, in some species, of the social structure and population stability of the recipient population;
6. Subsequent spread of introduced forms into unintended areas;
7. Unintentional introduction or spread of parasites or disease vectors;
8. Creation of a false sense of management accomplishment (and a masking of underlying environmental difficulties) in situations where repeated translocations from a demographically strong source population are absorbed or lost in a recipient population that is not self-sustaining and represents a demographic sink.

The widescale translocation of wildlife in the 19th and 20th centuries resulted in an unprecedented degree of genetic mixing and the creation of blended populations which no longer preserve the genetic character of indigenous and locally adapted populations. In Europe, the introduction of sika deer on red deer range beginning in the 1960s has resulted in large scale hybridization which threatens to destroy the red deer as a species (Harrington, 1973; Lowe and Gardiner, 1975; Bartos et al., 1981). A number of subspecies populations are threatened by sika hybridization, and by hybridization with other deer subspecies on a very large scale. Very few original populations remain pure.

In North America, the disregard for the hazards of careless translocation is currently represented by the intentional introduction of *Odocoileus virginianus borealis* from the U.S. to the historical range of *O.v.couesi* in Mexico, and the mixing of *borealis* with *texanus* and *mcillhenyi* within the U.S. (Etling, 1985). The escape of European red deer from commercial ranching operations

in Canada and the U.S. threatens the health and genetic integrity of the American wapiti, *Cervus elephus canadensis*.

While the long term evolutionary result of these events can not be predicted, the DSG maintains that, in practice, introductions pose greater risks to environmental well-being and ecological balance than purported economic or recreational benefits. Several species pose serious threats because of their tenacity and highly competitive traits, namely, *Dama dama*, *Cervus elaphus*, *Cervus nippon*, *Cervus timorensis*, and *Muntiacus reevesi* (see Flygger, 1960; Feldhamer, 1978; Keiper, 1975; Davidson and Crowe, 1983; Davidson et al., 1985). The proposed importation of these species for deer farming, as well as others for acclimation in the free state should be subjected to scientific scrutiny. The assessment of risk should be subject to the environmental impact process, and its execution should be tied to adequate liability insurance (Massey, 1986).

Human Utilization of Wildlife

Human-induced environmental alteration has had dramatic impacts on cervid and other wildlife populations historically, and continues to threaten the stability and continued existence of wildlife communities. Yet, wildlife has intrinsic value for the welfare of humanity, including the potential for generating large economic rewards. Wildlife management systems in the United States and Canada, in part derivative of resident aboriginal hunter-gatherer culture (Feit, 1987), provide time-tested principals for stimulating broad support and protection for wildlife while generating widely shared monetary return (\$65 billion U.S., Fillion, et al., 1983; USFWS, 1985). These principals have been borrowed recently by the governments of Zimbabwe, the Northwest Territories and others with documentable success (Crowe, pers. comm. also REF in Cons Bio entitled something like "Transfer of Wildlife Mgmt to Africa). Other wildlife management models, such as those employed in central Europe and South Africa are either unsuccessful or require large bureaucracies and costly external policing (Geist, 1988).

Lesser developed countries are urgently seeking solutions to problems that threaten their wildlife resources. These solutions must preserve biological diversity while realizing broad economic benefit from the sustainable use of wildlife. A combination of cultural, political, economic, and historical factors usually prevent establishment of the successful North American wildlife management model. The systems used are not always time tested, may conflict with other conservation activities and governmental programs, and may invite environmental abuses (reference??).

The following statements summarize the position of the Deer Specialist Group. These statements are based on policies that evolved in North America and were strongly influenced by U.S. President Theodore Roosevelt and Canadian Prime Minister Sir Winfred Laurier before World War I (Geist, 1988, 1989). These policies reflect practices of native North American communities using wildlife for subsistence (Feit, 1987).

1. Wildlife is considered a public resource that may be managed for subsistence, recreational, educational, conservation, and scientific purposes.

Because wildlife is a resource held in trust for the public, the public and private use of wildlife is regulated by governments. With the exception of some elusive small-bodied species (e.g., furbearers), wildlife is not considered a medium of economic exchange.

2. Commerce in vulnerable wildlife or products thereof is detrimental to self-sustaining wildlife populations.

Regulatory systems controlling commerce in wildlife have not proven effective. With very few exceptions, the development of markets in wildlife, including game ranching industries, has contributed to disease transfer, competition by alien wildlife, hybridization of native populations and increased trade in illegally-taken wildlife.

As policy, this concept prevents the development of markets in dead wildlife, and should prevent game ranching industries with their many drawbacks (genetic pollution, competition, disease transfer) including developing legal infrastructures for trade that can be used to launder illegal wildlife.

3. The allocation of surplus wildlife for harvest should be by law. In principle, the allocation should benefit a broad segment of society in order to generate a maximum number of stake-holders.

This provision prevents allocation by the commercial market, land ownership or special social status. It positions every citizen as a potential beneficiary while motivating users to be politically active on behalf of wildlife. Increased economic gain from wildlife engenders better management and protection.

4. Wildlife must only be killed for justifiable cause (i.e., for food and other products, or to protect vital human interests).

This policy limits wasteful killing and makes consumptive use an economic liability. Killed wildlife is by definition excluded from multiple use (e.g. tourism, science) and can only be justified on a well-monitored sustainable yield basis.

5. Deer species which migrate across political boundaries must be managed co-operatively by sovereign states.

This requires international wildlife treaties to ensure the continued survival of species of international heritage.

6. All decisions in the execution of conservation policy should have a strong scientific component.

Research and the accumulation of scientific knowledge is vital to the execution of effective policy.

Because the management of wildlife in captivity can serve the purpose of conservation, we offer the following additional position statements.

7. Domestication of wild deer species should not be condoned.

Domestication of wild species is an irreversible genetic process that removes the population from the environmental system to which it is adapted. The conservation of wild ungulates, and in particular threatened species, should be closely linked to the preservation of natural ecosystems supporting them. Wherever possible, the sustainable use of ungulates should be practiced in situ, i.e. within natural ecosystems.

One of the major dangers of domestication is the genetic contamination of wild stock of the species (Klein, /).

8. When wild deer are taken into captivity, every effort must be made to preserve wild traits through scientific management

Captive propagation should serve the primary purpose of maintaining the natural genetic diversity of the species. Husbandry tends to modify wild traits, and therefore, must be based on a sound biological understanding of the species in the wild.

References