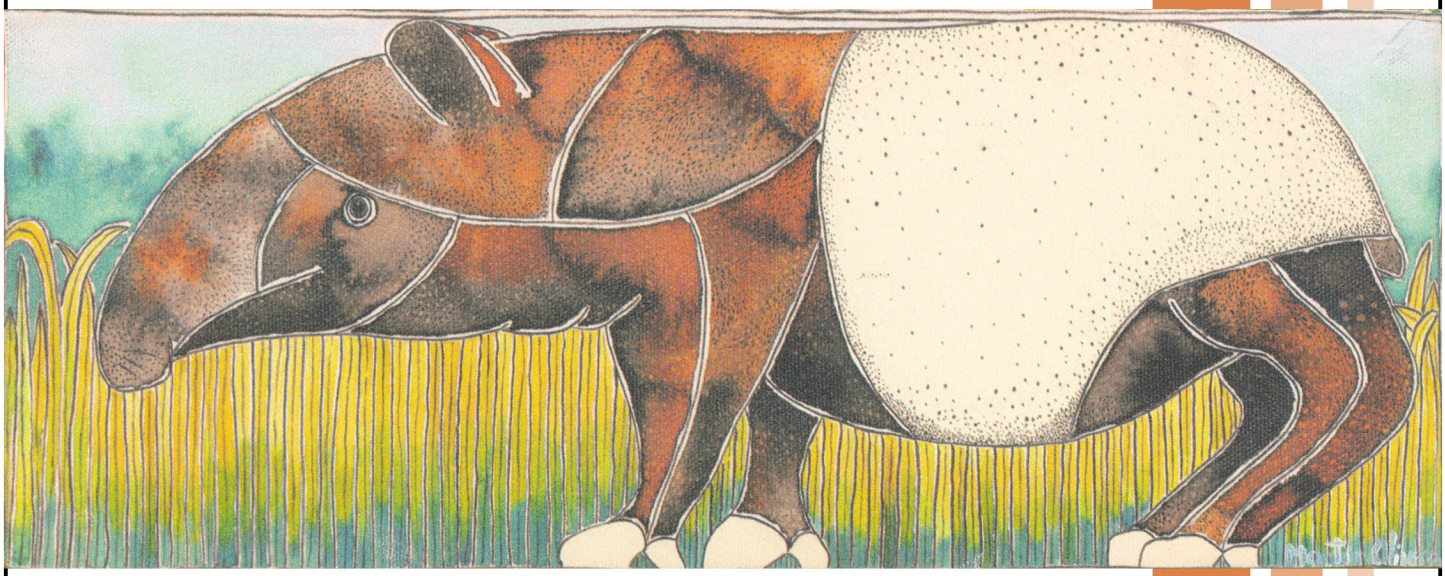
Malay Tapir (*Tapirus indicus*)

Conservation Workshop



12 - 16 August 2003
Krau Wildlife Reserve, Malaysia
FINAL REPORT

WILDLIFE CONSERVATION SOCIETY

EAZA

ZOO COPENHAGEN

PERHILITAN

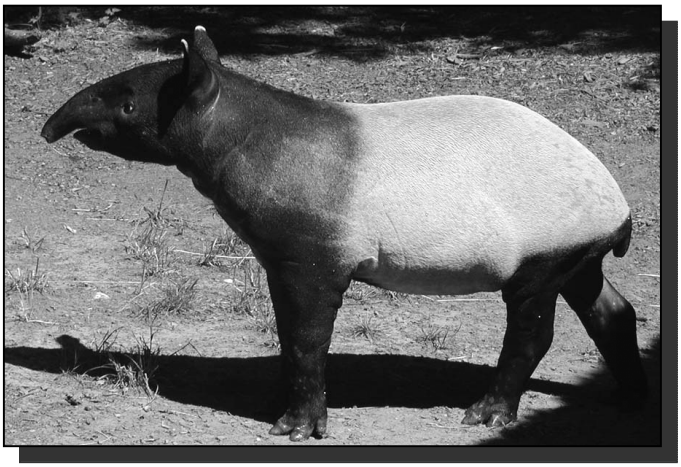
TAPIR SPECIALIST GROUP

Malay Tapir Conservation Workshop

12 – 16 August 2003

National Biology Conservation Training Center
Krau Wildlife Reserve, Malaysia

FINAL WORKSHOP REPORT



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Workshop organized by: IUCN/SSC Tapir Specialist Group (TSG); European Association of Zoos and Aquaria (EAZA) Tapir Taxon Advisory Group (TAG); Department of Wildlife and National Parks (DWNP), Malaysia; IUCN/SSC Conservation Breeding Specialist Group (CBSG).

Workshop financial support provided by: Copenhagen Zoo; Department of Wildlife and National Parks (DWNP), Malaysia; Wildlife Conservation Society Thailand.

Cover painting by Martín Olivera.

Workshop facilitated by: Conservation Breeding Specialist Group (www.cbsg.org).

Medici, E.P., A. Lynam, R. Boonratana, K. Kawanishi, S. Hawa Yatim, C. Traeholt, B. Holst, and P.S. Miller (eds.). 2003. *Malay Tapir Conservation Workshop. Final Report*. IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, MN, USA.

Malay Tapir Conservation Workshop

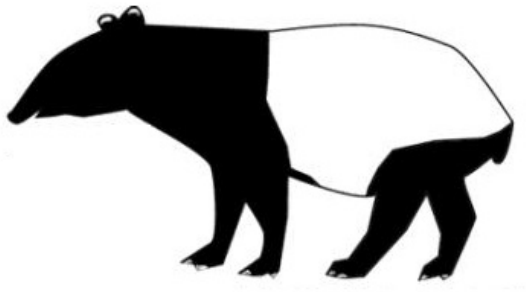
National Biology Conservation Training Center
Krau Wildlife Reserve, Malaysia

TABLE OF CONTENTS

Malay Tapir Conservation Workshop

12 – 16 August 2003

National Biology Conservation Training Center
Krau Wildlife Reserve, Malaysia



Section 1
Executive Summary

Malay Tapir (*Tapirus indicus*) Conservation Workshop Executive Summary

Introduction

During the *First International Tapir Symposium* held in Costa Rica in November 2001 it became clear that one of the biggest concerns among tapir experts today is the Malay tapir conservation. The Malay tapir is presently listed as Vulnerable on the IUCN Red List of Threatened Species (2001 Assessment), meaning that this species is facing a high risk of extinction in the wild in the medium-term future. Furthermore, the species is listed on CITES Appendix 1, which strictly bans their international trade. According to Meijaard and van Strien (in press), habitat destruction and human disturbance have had major impacts on the survival of the species. The hunting pressure on Malay tapirs may not be of a similar order as that on tigers or rhinos, as tapir parts are not valued as medicine or for other purposes, but we are unaware to what extent hunting contributes to local population density decreases within the tapir's range. Furthermore, tapir meat is not a major component of the diet of local populations. So far the legal protection of tapirs seems to have been unable to slow down their decline. The slow reproduction rate of tapirs (inter-birth interval is two years and generally there is one young) may make it difficult to recover from low population numbers, especially now that parts of their range is completely fragmented, leaving small remnant populations isolated from each other. Another problem is that in many parts of its range the Malay tapir occurs outside protected areas.

Additionally, there are very few long-term tapir *in situ* projects being conducted in Asia and the data and information currently available are not enough to provide a clear view about the conservation status of the species. The Malay tapir distribution, for example, has never been studied in depth. More than 180 years after scientists first described the species we are still largely at loss of basic facts such as the estimated total number of Malay tapir or the limits of the range of the species. As stated by the IUCN/SSC Tapir Specialist Group *Status Survey and Conservation Action Plan: Tapirs* (Brooks, Bodmer & Matola 1997), tapirs closely resembling the Malayan tapir were found in India and Myanmar (Burma) during the Pliocene. These animals were isolated to the tropical regions of America and southeast Asia during the Pleistocene ice ages. The range of tapir has been reduced extensively in Myanmar (Burma), Thailand, Cambodia, and Sumatra. Today populations are extremely fragmented, occurring in southern Viet Nam, southern Cambodia, parts of southern Myanmar (Burma), Tak Province in Thailand, and through the Malay Peninsula to Sumatra south of the Toba highlands (Gnampongsai in litt., Williams and Petrides 1980, Van Strien in litt.) as seen in Figure 1. The Malay tapir is a very important flagship species, where many sympatric species would be placed under an umbrella of protection. Its conservation will indirectly conserve biodiversity. Viable populations of the species are necessary in core areas of its distribution and population monitoring programs need to be put in place. The problems facing Malay tapir in every country of occurrence have to be evaluated, with appropriate required actions recommended for implementation (Brooks, Bodmer & Matola 1997).

Figure 1. Distribution of the Malay Tapir, *Tapirus indicus.*
(adapted from van Strien and Meijaard, unpublished 2004).

Based on all this and on some suggestions made during the symposium in Costa Rica, the IUCN/SSC Tapir Specialist Group (TSG) decided to organize and hold a Malay Tapir Conservation Workshop in Asia. In the past, the work of the Tapir Specialist Group was heavily biased towards work on the three Latin American tapir species, mainly because each of these species were backed by a significant group of researchers and professional and amateur conservationists, whereas the Malay tapir almost completely lacked such support. Today, the TSG has 18 members who directly deal with the Malay tapir, 25% of the membership, and the group has decided that it is time to prioritize this species. If this species is to survive in the wild some very serious conservation action is needed.

Workshop Objectives and Goals

The main goal of this workshop was to gather, systematize and discuss all the available data and information on Malay tapirs (population demographic parameters - *e.g.* age structure, birth rates, mortality, dispersal, and other biological data, the species current status and distribution, threats to survival across its range, available habitat) and use this information to generate research and establish management options and conservation priorities for the species. The specific objectives are (1) to define the limits of Malay tapir populations in remaining habitats, (2) to determine the status of tapir sub-populations, (3) to determine the threats to tapirs in these sub-populations, (4) to define geographic areas where tapirs have a chance of long-term survival, (5) to prioritize conservation and management actions necessary to save Malay tapirs across these areas, and (6) to develop a communication strategy to reach policy and decision-makers.

Expected Outcome

The main outcome of the workshop will be an update and refinement of the Malay Tapir section of the 1997 Tapir Action Plan, concentrating on recommendations for the preservation in the wild, but also with attention for the captive population, education and extension, research priorities and funding. It is necessary to design a clear tapir conservation strategy in which, based on scientific information, a selection is made of the most important required activities in each of the countries of occurrence. On the other hand, the lack of law enforcement in and outside protected areas is one of the most limiting factors to tapir survival in any of the countries of occurrence. As a consequence, ways to improve law enforcement as well as ways to promote tapir conservation that will reach out to the right target audiences should be discussed and listed. Finally, any recommendations will remain powerless unless the real commitment can be raised to preserve the Malay tapir. Therefore, another outcome expected from this workshop is the creation of a network of professionals and institutions committed to put in practice all the recommendations and necessary actions listed as priorities.

The CBSG Workshop Process

The IUCN / SSC Tapir Specialist Group invited their sister organization, the Conservation Breeding Specialist Group (CBSG) of the IUCN, to conduct the workshop in the framework of updating and developing of the IUCN/SSC Status Surveys and Conservation Action Plan for the Malay Tapir. CBSG utilized their Population and Habitat Viability Assessment (PHVA) workshop process. The ability to revise the Action Plan is greatly improved by the intensive analysis and collaborative deliberations that make up a PHVA workshop.

Effective conservation action is best built upon critical examination and use of all available biological information, but also critically depends upon the actions of humans living within the range of the threatened species. Motivation for organizing and participating in a PHVA workshop comes from fear of loss as well as hope for recovery of a particular species.

At the beginning of a PHVA workshop, there is agreement among the participants that the general desired outcome is to prevent the extinction of the species and to maintain a viable population(s). The workshop process then takes an in-depth look at the species' life history, population history, status, and growth dynamics in order to assess the threats that put the species at risk of population decline or extinction. One crucial outcome of the workshop is that an enormous amount of information can be gathered and considered that, to date, has not been assembled or published in a single forum. This information can be from many sources: the contributions of all people with a stake in the future of the species are considered. Information contributed by landowners, hunters, scientists, field biologists and zoo managers all carry equal importance in the data assembly and analysis process.

To obtain the full picture concerning a species, all the information that can be gathered is discussed by the workshop participants with the aim of first reaching agreement on the state of this current information. Relevant data are then incorporated into Vortex, a computer simulation model of population growth dynamics to determine: (1) risk of population extinction under current conditions; (2) those factors that make the species particularly vulnerable to extinction; and (3) which factors, if changed or manipulated, may have the greatest effect on preventing extinction. In essence, these computer modeling activities provide a neutral platform upon which we may examine the current situation and what needs to be change to prevent species or population extinction.

Complementary to the modeling process is a communication process, or deliberation, that takes place during a PHVA. Workshop participants work together to identify the key issues affecting the conservation of the species. During the PHVA process, participants work in small groups to discuss identified key issues, whether predator management, disease, human-animal interactions, or similar emergent topics. Each working group produces a report on their topic, which is included in the PHVA document resulting from the meeting. A successful workshop depends on determining an outcome where all participants, coming to the workshop with different interests and needs, "win" in developing a management strategy for the species in question. Local solutions take priority – workshop recommendations are developed by, and are the property of – the local participants.

The Malay Tapir Conservation Workshop was held 12 – 16 August 2003 at the National Biology Conservation Training Center in Krau Wildlife Reserve, Malaysia. The Reserve is in the central region of peninsular Malaysia and is administered by the Department of Wildlife and National Parks (DWNP) of Peninsular Malaysia. With excellent accommodations and meeting facilities in a beautiful semi-isolated forested setting, the Training Center made an ideal location for the intense activities that characterize a PHVA workshop. The workshop was introduced by the Director General of DWNP and the Chair of the IUCN / SSC Tapir Specialist Group, and was then officially opened by the Minister of Science, Technology and Environment of Malaysia. Upon completion of the formal opening festivities, each participant was asked to introduce

themselves and to state their own views regarding the most important issues facing conservation of the Malay tapir in the region over the next 25 years. Following a series of highly informative presentations by tapir biologists from the Southeast Asian region and around the world, the workshop facilitators (Amy Camacho, CBSG – Mexico Regional Network Convener and Philip Miller, CBSG Senior Program Officer) identified four working group topics based on the conservation issue statements presented earlier: Malay Tapir Distribution and Habitat, Population Biology and Simulation Modeling, Threats to Tapir Persistence, and Species Management. Participants were then asked to join one of these groups at their discretion and each group was given the following tasks:

- Discuss and refine the topic-specific issues identified in the opening session;
- Prioritize the refined issues;
- Assemble and analyze information pertinent to the topic;
- Develop a priority list of short-term (i.e., 1-year) and long-term (5-year) goals for each issue;
- Develop and prioritize detailed actions steps for each high-priority goals; and
- Identify the many types of resources required to implement the high-priority action steps.

Each group presented the results of their deliberations in plenary sessions to guarantee everyone had an opportunity to contribute to the work of the other groups and to ensure that issues were carefully reviewed and discussed by the group. The recommendations coming from the workshop were accepted by all participants, thus representing a form of consensus. Working group reports can be found in Sections 2 – 5 of this document.

Working Group Summaries and Recommendations

A summary of working group recommendations is given below, broken out into those specific to tapir conservation and those that are thought to address more general (but equally important) conservation issues. At the end of the workshop, each group was asked to bring their top three recommendations to a final plenary session, at which time the plenary group was asked to develop a group priority list of the twelve recommendations presented. It is important to realize that the choice of how many recommendations to prioritize was arbitrary and was made by the workshop facilitators on the basis of logistical feasibility at the end of an intense 5-day workshop. As there were more than twelve recommendations developed by the four working groups, the presentation of the prioritized list of twelve at the end of this section does not reduce the validity of the remaining recommendations.

Distribution and Habitat

Top three priority action steps:

1. Develop/build capacity of appropriate personnel in data analysis and interpretation
2. Recommend agencies/institutions, under whose jurisdiction wildlife research and management fall, to ensure that each tapir research project includes a training component for local people (staff /community/students)

3. Develop a tailor made system reflecting the national need(s) and capacity that can ensure collected data are double-checked, crosschecked and deficiencies addressed, and properly filed and stored

Tapir-specific recommendations

- Approach a regional agency (e.g. ASEAN Regional Centre for Biodiversity Conservation - ARCBC) and request they incorporate/promote tapir conservation into their planned training programs for ASEAN Member Countries nationals' to meet ASEAN PA occupational standards.
- Widely distribute workshop outputs to relevant agencies/institutions and field personnel
- Recommend agencies/institutions, under whose jurisdiction wildlife research and management fall, to ensure that each tapir research project includes a training component for local people (staff /community/students)
- Review current data collection methods in tapir range states
- Recommend that relevant agencies/institutions involved with wildlife research and management carry out regular (minimum every 2 years) status reviews of significant tapir areas
- On national level, recommend that funds are made available to create a tapir central database
- Develop a working group with representatives from all tapir range states and encourage stronger collaboration and information sharing
- Establish working group to coordinate storage facilities in tapir range states

General recommendations

- Recommend that field expenses are prioritized in budget allocations within wildlife departments, NGOs (e.g. WWF Malaysia) and other agencies/institutions involved in wildlife research, protection and management
- Develop/build capacity of personnel in data analysis and interpretation
- Develop a tailor made system reflecting the national need(s) and capacity that can ensure collected data are double-checked, crosschecked and deficiencies addressed
- Develop a working group with representatives from all stakeholders that should assemble quarterly and encourage information sharing
- Strive to obtain independent review of information intended for public disclosure/publishing
- Develop a standardized form and format for data collection and monitoring
- Promote more open information sharing including access through the internet
- Develop MOU between relevant stakeholders
- Develop and implement unambiguous standards for data utilization
- Develop standard methods for data management practices
- Recommend that agencies/institutions integrate smooth transition practices when rotating/changing staff
- Recommend that Government agencies/institution should re-evaluate the career structure and recruit and retain qualified personnel in relevant position

- Develop clear and unambiguous standards and protocols for data publication including proper acknowledgement of sources
- Create national working groups with a task to develop central and secure storage system in range states

Population Biology and Simulation Modeling

Top three priority actions steps:

1. Design and implement two detailed field studies (Sumatra and Peninsular Malaysia) to generate more precise estimates of selected demographic parameters: Density and Survival rates (primarily of adults)
2. Develop an assessment of the level of extraction of Malay tapirs (hunting, by-catch, road kills, etc)
3. Design and implementation of a study to evaluate the genetic diversity of Malay tapirs throughout their range

Tapir-specific recommendations

- Design and implement two detailed field studies (Sumatra and Peninsular Malaysia) to generate more precise estimates of selected demographic parameters: Density and Survival rates (primarily of adults).
- Improve/complement our database on distribution of Malay tapirs throughout their range.
- Design and implementation of a study to evaluate the genetic diversity of Malay tapirs throughout their range.
- Develop an assessment of the level of extraction of Malay tapirs (hunting, by-catch, hit by cars, etc).
- Periodic supplement of results from long-term studies into Malay tapir database.

Threats to Tapirs

Top three priority action steps:

1. To conduct awareness campaign about the importance of buffer zones in all four range countries (directed towards the communities around Protected Areas, managers and relevant authorities)
2. To develop Terms of Reference for landscape planning with inclusion of conservation considerations
3. To create incentives and support for people "on the ground" to enforce the law

Tapir-specific recommendations

- To organise a seminar on tapir conservation for GO and NGO stakeholders, zoos and universities

- To produce and distribute leaflets about tapir conservation to the public (schools, zoos, visitor centres etc.).
- To implement an "Adopt a Tapir" program in relevant zoos
- To approach public sector for funding of the above mentioned action steps
- To establish a stakeholder network with the purpose of exchanging information about tapir conservation measures both nationally and internationally (among tapir range
- Nationally to establish a co-ordinating body with members from relevant governmental departments to agree upon the enforcement of rules and regulations relating to tapirs.
- To create incentives and support for people "on the ground" to enforce laws pertaining to tapirs.
- To conduct research on tapir ecology, surveys on tapir distribution and relate data to distribution of vegetation
- To define and identify tapir "core areas"
- To conduct an overall registration of tapir presence in close co-operation with NGOs and local people
- To develop and distribute PR material regarding registration of tapir presence
- To develop standard format for collection of tapir data
- To establish central databases in each range country and at TSG for tapir registration
- Allocate necessary funds for tapir research, survey implementation and database construction
- To identify tapir core areas in the three range countries that need further protection
- To conduct a workshop for relevant authorities to improve co-operation on conservation matters
- To develop Terms of Reference for landscape planning with inclusion of tapir conservation considerations
- To make reference to Terms of Reference for all new developments obligatory
- To conduct a survey on the sensitivity of Tapir habitats to fire
- To include tapir habitat sensitivity to fire in landscape planning (zoning, buffer zones etc.)
- To develop standards for registration of captures and kills of tapirs
- To register all captures and kills of tapirs
- To encourage authorities to revise penalties for illegal capture of wildlife and snare hunting
- To establish a central body for the four range countries to oversee the issue of export
- To encourage development and implementation of action plans for Protected Areas relevant for tapir conservation
- To revise action plans for Protected Areas every 5 years
- Conduct workshops in all four tapir range countries to define "carrying capacity" for all Protected Areas relevant for tapir conservation with regard to number of visitors/visitor activities
- To encourage relevant authorities to address ecotourism in all action plans for Protected Areas relevant to tapir conservation
- To encourage relevant authorities to use zoning in action plans for Protected Areas relevant to tapir conservation

General recommendations

- To conduct a workshop for all four range countries to develop standards for the use of buffer zones around Protected Areas
- To conduct awareness campaign about the importance of buffer zones in all four range countries (directed towards the communities around Protected Areas, managers and relevant authorities)
- To establish a co-ordinating body for stakeholders with the purpose of disseminating information to stakeholders.
- To identify potential buffer zone areas around existing Protected Areas
- To implement buffer zone standards in existing and future Protected Area management plans
- To conduct workshops in range countries to develop standards for building of new roads in and around protected areas (inclusion of wildlife passages)
- Make restoration/re-planting of forest after closure of non-used roads in protected areas obligatory
- Make it obligatory to include conservation concerns in the planning of roads and rural development in and around Protected Areas (including traffic restrictions and zoning)
- To monitor wildlife activities after restoration of forest
- To develop and implement education programme and awareness campaign for sustainable agriculture
- Organise a seminar for stakeholders about ”wise” use of land
- Conduct a workshop with the following tasks:
  - To identify fire-fighting needs regarding equipment and expertise
  - To develop standards for fire-fighting units (organisation, equipment etc.) to identify suitable places for setup of fire-fighting units
- Allocate budget for training and implementation of fire-fighting units
- To establish a fire-fighting task force co-ordinating fire-fighting in all nine provinces of Sumatra
- To conduct awareness campaigns about protection of wildlife and existing hunting regulations in the four range countries
- To identify existing action plans for Protected Areas
- To regulate number of tourist activities in Protected Areas according to carrying capacity

Species Management

Top three priority action steps:

1. Initiate training programs for *in-situ* and *ex-situ* tapir conservation: population studies, reproduction, ecology and behavior
2. Organize and conduct an ASEAN meeting focusing on large mammal conservation in the region
3. Organize and conduct a meeting of NGOs on regional tapir conservation

Tapir-specific recommendations

- Conduct national–level studies on resource management and land-use sectoral development and biological diversity policies in view of identifying sectors that support tapir habitat conservation.
- Organize and conduct an ASEAN meeting focusing on large mammal conservation in the region.
- Develop funds for tapir research in the region.
- Initiate training programs for *in-situ* and *ex-situ* tapir conservation: population studies, reproduction, and behavior
- Establish a Global Tapir Forum
- Organize and conduct a meeting of NGOs on regional tapir conservation
- Develop an awareness campaign among local stakeholder communities (hunters, local villagers, etc.)

General recommendations

- Develop an inventory of policies related to wildlife management
- Revise and rewrite appropriate policies and propose the resulting modified policies to the Malaysian Parliament and similar institutions in other countries
- Conduct a detailed cost – benefit analysis of economic development vs. conservation policies
- Establish a regional Wildlife Research Institute with courses designed to address country-specific and cross-boundary regional issues
- Develop a Rural Participatory workshop
- Create opportunities for conservation- and tourism-related jobs such as nature guides, rangers, boatmen, etc.

Final Group Prioritization of Workshop Recommendations

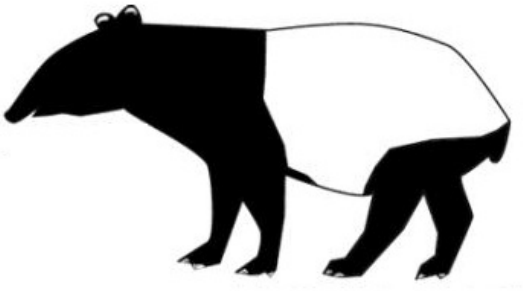
Each of the working groups brought their own top three priority action steps to a final workshop plenary, during which time the full body of participants used a paired-ranking technique to prioritize the full list of twelve actions. The list is given below, with the numerical score resulting from the prioritization given in brackets.

1. Recommend agencies/institutions, under whose jurisdiction wildlife research and management fall, to ensure that each tapir research project includes a training component for local people (staff /community/students) [200]
2. To conduct awareness campaign about the importance of buffer zones in all four range countries (directed towards the communities around Protected Areas, managers and relevant authorities) [192]
3. To develop Terms of Reference for landscape planning with inclusion of conservation considerations [186]
4. Design and implement two detailed field studies (Sumatra and Peninsular Malaysia) to generate more precise estimates of selected demographic parameters: Density and Survival rates (primarily of adults) [175]
5. To create incentives and support for people "on the ground" to enforce the law [168]
6. Develop an assessment of the level of extraction of Malay tapirs (hunting, by-catch, road kills, etc) [149]
7. Develop/build capacity of appropriate personnel in data analysis and interpretation [142]
8. Initiate training programs for *in-situ* and *ex-situ* tapir conservation: population studies, reproduction, ecology and behavior [117]
9. Develop a tailor made system reflecting the national need(s) and capacity that can ensure collected data are double-checked, crosschecked and deficiencies addressed, and properly filed and stored [117]
10. Organize and conduct an ASEAN meeting focusing on large mammal conservation in the region [84]
11. Design and implementation of a study to evaluate the genetic diversity of Malay tapirs throughout their range [84]
12. Organize and conduct a meeting of NGOs on regional tapir conservation [60]

Malay Tapir Conservation Workshop

12 – 16 August 2003

National Biology Conservation Training Center
Krau Wildlife Reserve, Malaysia



Section 2
Distribution and Habitat (Database) Working Group

Distribution and Habitat (Database) Working Group Report

Working Group participants:

Nico van Strien	SE Asia Coordinator, International Rhino Foundation, Indonesia
Ramesh Boonratana	Independent Consultant / IUCN/SSC Primate Specialist Group, Thailand
Kae Kawanishi	Division of Research and Conservation, Department of Wildlife and National Parks, Malaysia
Hasdi Hassan	Division of Research and Conservation, Department of Wildlife and National Parks, Malaysia
Wilson Novarino	Lecturer, Dept. Biology FMIPA, Andalas University, Indonesia
Mohd. Taufik Abd. Rahman	Krau Wildlife Reserve, Department of Wildlife and National Parks, Malaysia
Carl Traeholt	Project Coordinator, Malay Tapir Project, Krau Wildlife Reserve, Malaysia

Overview

Little information is available on the Malay tapir: ecology, behavior, especially distribution records

Problem Statements

Data Collection

There is a lack of uniformity and quality in data collection methods, coverage and human resources (including officials and the general public)

Data Management

There is insufficient unified management and weak international coordination and collaboration. In addition there is limited access to land use data and a rivalry between stakeholders.

Data Sharing

Fear of unauthorized use, misuse and loss of control over data.

Data Storage

Lack of centralized, coordinated and secure data storage.

Summary of Working Group Deliberations

Issues (prioritized)	Problem Identification	Data Assembly/Analysis	Goals	#[1]
1. Data collection	1.1 Lack of uniformity in collection/research methods		1.1 To develop and implement uniform data collection methods in all tapir range countries	1
	1.1.1 There is no standard data format i.e. uniformity of collected data e.g. GPS position formats (different country use different position format e.g. lat/long, national grid)	1.1.1 **a)** Availability of equipment especially maps [M][2] **b)** Different formats within/between countries [M]		
	1.1.2 There is no consistency in type and importance of evidence recorded	1.1.2 **a)** Different data recording sheets, but absence/presence is common to all [H][3] **b)** Difference methods of photo-trapping (comparison of data is difficult) [L][4] **c)** Gathering of supporting evidence (e.g. photos, plaster casts, dung) [H] **d)** Level of details in recording [L]		
	1.1.3 There is a big disparity in trained personnel i.e. some are very good and some are novices	1.1.3 **a)** No/weak capacity in map reading and compass use [H] **b)** Datasheets not tailored to capacity of personnel (Krau		

		uses a system where illiterate personnel just have to mark a "sign" as eye (direct observation), footprint (tracks) etc. [M/H] **c)** Career structure is not merit based [H] **d)** Field work not appropriately recognized [H]		
	1.1.4 There is not enough reliability of data i.e. lack of quality control by both internal and external referees	1.1.4 **a)** Feedback and encouragement from superiors [H] **b)** Falsified data due to lack of supervision [H/M] **c)** Manipulation of data [H]		
	1.2 Lack of coverage		1.2 To improve coverage and to develop standard methods for monitoring important tapir areas	0
	1.2.1 There is a strong bias towards 'popular' species	1.2.1 **a)** The amount of monies for "popular" species [H] **b)** A lot of tapir information come from other species' projects [M/L] **c)** Absence of officers to focus on tapir [M] **d)** Limited numbers of published items (scientific and popular) and documentaries on tapir [M] **e)** There is not enough interest in		

		tapirs so there is no recording of hunting and road kills [H]		
	1.2.2 In many projects surveyors do not record data on non-target species despite ample opportunity to do so	1.2.2 **a)** Absence of tapir information in data sheets [M]		
	1.2.3 Insufficient resources – e.g. manpower and funds - to achieve total coverage i.e. survey all potential tapir conservation sites	1.2.3 **a)** There is no information or no regular update from many areas [H] **b)** Budget for field-activities has low priority [H] **c)** Off-limit areas [M]		
	1.3 Lack of human resources (specialists)		1.3 **a)** To build capacity of field staff to meet the minimum requirement with respect to the ASEAN PA occupational standards **b)** To ensure higher priority in budget planning for field work	3 2
	1.3.1 Not enough public involvement in information collection	1.3.1 **a)** No volunteer groups monitoring tapir [M/L] **b)** No public-initiated funds/grants [L]		
	1.3.2 Insufficient availability of	1.3.2 **a)** Only one graduate student from		

	qualified and/or committed staff in organizations that deal with wildlife management and biodiversity conservation	Malaysia and three in Indonesia working on tapir [H] **b)** Few research programs on tapir [H]		
2. Data management	2.1 Lack of uniformity in methods and applications	2.1 see 1.1 and 4.1 [M]	2.1 To develop and implement uniform data management practices	2
	2.2 Inadequate human resources	2.2 see 1.3 and 4.4 [H]	2.2 To build capacity of personnel in data analysis and interpretation	8
	2.3 Weak international coordination and collaboration between relevant organizations/institutions	2.3 No formal international collaboration i.e. between Malay tapir range country institutions – only ad hoc TSG [H]	2.3 To strengthen national and international collaboration and coordination	3
	2.4 Limited/restrictive access to data on conservation areas, habitats, land use	2.4 **a)** Data is spread over many different institutions [M] **b)** Some data are for restricted use only e.g. topographic maps in Malaysia [H] **c)** High cost for certain types of data [M]	2.4 To ease access to relevant and related accessory data	5
	2.5 Conflict of interests between stakeholder agencies - including departmental rivalry	2.5 **a)** Unwillingness to communicate [H] **b)** Limited coordination and collaboration in land use	2.5 To promote better cooperation and coordination activities	6

		planning in relation to wildlife and biodiversity [H]		
	2.5.1 Unqualified personnel occupy key positions i.e. staff often obtain positions through political/personal connections and/or seniority (time - dependant) instead of merits	2.5.1 Employment system can be based on seniority e.g. further education leads to loss of place in seniority compared to personnel that remains in the department [M]	2.5.1 To promote a merit based career system in conservation (e.g. using components of the ASEAN occupational standards)	0
	2.5.2 Qualified/specialized personnel are often transferred to other positions	2.5.2 Many institutions have a standard rotation system [M]	2.5.2 To promote and maintain stability in the placement of personnel especially in supervisory positions	2
	2.6 Fear of unauthorized use of data (data ownership)	2.6 **a)** Certain data are restricted [M] **b)** "Play it safe" attitude [M]	2.6 To develop clear and unambiguous standards for data utilization	3
	2.7 Questionable quality of data sets	2.7 **a)** Publication of unverifiable data (e.g. guesstimates, "feel good" numbers) [H] **b)** Uncritical reference to unverifiable data [H] **c)** Presented data conflicts with reality [H] **d)** Uncritical data collection and	2.7 To ensure sufficient quality control at all staff levels	7

		data analysis [H] **e)** Data quoted out of context [H]		
3. Data Sharing	3.1 Fear of unauthorized / misuse of unpublished data	3.1 **a)** Reluctance to publish distribution maps for fear of misuse by poachers [H] **b)** Fear of premature publication of data [H]	3.1 – 3.3 To develop clear and unambiguous standards and protocols of data publication including proper acknowledgement of sources	
	3.2 Fear of loss of control over data	3.2 Theft of data e.g. papers based on other people's collections [M]		
	3.3 Lack of information sharing protocols	3.3 There are no protocols – when somebody requests for data they are often stalled until an "agreement" has been made i.e. how to use them, reference, credit etc. [H]		
4. Data storage	4.1 Lack of uniformity – e.g. software and hardware	4.1 **a)** Utilization of different types of data base systems (e.g. Access, QPro, McKinnon's) **b)** Different types of GIS software	4.1 To develop and implement uniform data storage system	0
	4.2 No central/coordinated storage efforts e.g. central database	4.2 **a)** There isn't any central agency for coordinating the storage of data **b)** National data bases are established in some range states but doesn't cover all data sets	4.2 – 4.3 To promote and develop central and secure storage system in each range state and a coordinated storage facility in	1

			the tapir range states i.e. from ALL agencies	
	4.3 Insufficient security (data losses due to system crashes, no back up systems)	4.3 **a)** Data has been lost **b)** Limited duplicates of data		
	4.4 Inadequate human resources	4.4 Absence of individuals assigned to manage data in some range countries		

[1] Number of priority
[2] Medium data quality
[3] High data quality
[4] Low data quality

Goals and Recommended Actions

Goal 1

To build capacity of field staff to meet the minimum requirement re. The ASEAN PA occupational standards

Time schedule: 3-5 years

Estimated cost: US$1,000,000

Actions

1. Approach a regional agency (e.g. ARCBC) and request they incorporate/promote tapir conservation into their planned training programmes for AMC nationals' to meet ASEAN PA occupational standards.
   Time: 1-3 months
   Cost: US$3,000-5,000
   Responsibility: Tapir Specialist Group (TSG)
   Indicators: ARCBC occupational standards adopted in all training programs and similar standards implemented in national career structures

2. Widely distribute workshop outputs to relevant agencies/institutions and field personnel
   Time: Ongoing
   Cost: US$10,000-12,000
   Responsibility: TSG (members) and local relevant agencies and institutions
   Indicators: Relevant agencies/institutions and field personnel have a copy of the Malay Tapir Action Plan

3. Recommend agencies/institutions, under whose jurisdiction wildlife research and management fall, to ensure that each tapir research project includes a training component for local people (staff /community/students) *Time*: Continuous
   Cost: Nil
   Responsibility: TSG and tapir research project coordinators
   Indicators: Training is conducted

Goal 2

To ensure higher priority in budget planning for field work

Time schedule: Continuous

Estimated cost: Traveling expenses

Actions

1. Recommend that field expenses are prioritized in budget allocations within wildlife departments, NGOs (e.g. WWF-M) and other agencies/institutions involved in wildlife research, protection and management
   Responsibility: Everybody
   Indicators: Sufficient funds available for field work

Goal 3

To develop and implement uniform data collection methods in all tapir range countries, to improve coverage and to develop standard methods for monitoring important tapir areas

Time schedule: 3-5 years

Estimated cost: US$1,000,000

Actions

1. Review current data collection methods in tapir range states
   Time: 1-3 months
   Cost: US$10,000 – 15,000
   Responsibility: Range state representatives (to be selected) coordinated by MTC
   Indicators: Uniform data collection method implemented in range states

2. Develop a standardized form and format for data collection and monitoring
   Time: 3-6 months
   Cost: US$10,000 – 15,000
   Responsibility: Range state representatives (to be selected) coordinated by MTC
   Indicators: Uniform data collection method implemented in range states

3. Recommend that relevant agencies/institutions involved with wildlife research and management carry out regular (minimum every 2 years) status reviews of significant tapir areas
   Time: Ongoing
   Cost: Nil
   Responsibility: TSG
   Indicators: Updates of population status are available from each range state and presented at TSG meetings

Goal 4

To build capacity of personnel in data analysis and interpretation

Time schedule: 3-5 years

Estimated cost: US$1,000,000

Actions

1. Develop/build capacity
   Responsibility: Relevant departments responsible for wildlife research and management
   Indicators: Qualified personnel available

Goal 5

To ensure sufficient quality control at all staff levels

Actions

1. Develop a tailor–made system reflecting the national need(s) and capacity that can ensure collected data are double-checked, crosschecked and deficiencies addressed
   Time: 6 months

Cost: US$10,000 – 15,000
Responsibility: Senior departmental officers, external researchers and facilitators
Indicators: A tailor–made system is developed and in place in the respective agencies/institutions

2. Strive to obtain independent review of information intended for public disclosure/publishing *Time*: Ongoing
Cost: Minimal
Responsibility: TSG and relevant agencies/institutions in wildlife research and management
Indicators: Quality information is available

Goal 6
To promote better cooperation and coordination activities

Actions

1. Develop a working group with representatives from all stakeholders that should assemble quarterly and encourage information sharing
Time: 1-3 months
Cost: US$5,000
Responsibility: Representatives from respective stakeholders (i.e. concerned with wildlife research and management)
Indicators: Working group established and regular meetings held

Goal 7
To ease access to relevant and related accessory data

Actions

1. On national level, recommend that funds are made available to create a tapir central database *Time*: Ongoing
Cost: Nil
Responsibility: TSG is prime facilitator and relevant government agencies will be responsible for the recommendations
Indicators: Funds are available

2. Promote more open information sharing including access through www
Time: Ongoing
Cost: Nil
Responsibility: TSG, NGOs and all stakeholders
Indicators: Information is easy accessible through the World Wide Web

3. Develop MOU between relevant stakeholders
Time: 6-12 months
Cost: US$10,000 – 15,000
Responsibility: MOSTE (Malaysia), MOF (Indonesia) and equivalent government institutions in range states
Indicators: MOUs have been drafted and signed

Goal 8
A) To develop clear and unambiguous standards for data utilisation
B) To strengthen national and international collaboration and coordination

Actions

1. Develop and implement unambiguous standards
   Time: 12 months
   Cost: US$30,000
   Responsibility: IUCN
   Indicators: Standards developed and implemented

2. Develop a working group with representatives from all tapir range states and encourage stronger collaboration and information sharing
   Time: 1-3 months
   Cost: US$5,000
   Responsibility: Relevant stakeholders in all range states
   Indicators: Working group created and is active

Goal 9
A) To develop and implement uniform data management practices
B) To promote and maintain stability in the placement of personnel especially in supervisory positions

Actions

1. Develop standard methods for data management practices
   Time: 6 months
   Cost: US$10,000
   Responsibility: ARCBC
   Indicators: Standard methods are available
2. Recommend that agencies/institutions integrate smooth transition practices when rotating/changing staff
   Time: Ongoing
   Cost: Nil
   Responsibility: IUCN/ARCBC/TSG
   Indicators: Smooth staff transitions are observed within all relevant stakeholders

Goal 10
To promote a merit based career system in conservation (e.g. using components of the ASEAN occupational standards)

Actions

1. Recommend that Government agencies/institution should re-evaluate the career structure and recruit and retain qualified personnel in relevant position
   Time: Ongoing
   Cost: Nil
   Responsibility: Everybody

Indicators: Presence of more people in the right jobs

Goal 11

To develop clear and unambiguous standards and protocols for data publication including proper acknowledgement of sources

Actions

1. Develop clear and unambiguous standards and protocols
   Time: 12 months
   Cost: US$30,000
   Responsibility: IUCN
   Indicators: Standards and protocols are available for information sharing

Goal 12

To promote and develop a central and secure storage system in each range state and a coordinated storage facility in the tapir range states i.e. from ALL agencies

Actions

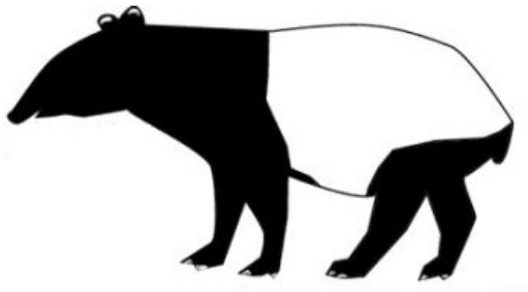
1. Create national working groups with a task to develop central and secure storage system in range states
   Time: 12 months
   Cost: US$25,000
   Responsibility: Relevant stakeholders i.e. relevant government agencies/institutions, NGOs, private institutions
   Indicators: Central and secure storage system is functional and accessible

2. Establish working group to coordinate storage facilities in tapir range states
   Time: 1-3 months
   Cost: US$5,000
   Responsibility: Relevant stakeholders in tapir range states
   Indicators: Working group established

Malay Tapir Conservation Workshop

12 – 16 August 2003

National Biology Conservation Training Center
Krau Wildlife Reserve, Malaysia



Section 3
Population Biology and Simulation Modeling Working Group

Population Biology And Simulation Modeling Working Group Report

***Working Group participants*:**

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Introduction

Population viability analysis (PVA) can be an extremely useful tool for assessing current and future risk of wildlife population decline and extinction. In addition, the need for and consequences of alternative management strategies can be modeled to suggest which practices may be the most effective in conserving the Malay tapir (*Tapirus indicus*) in its wild habitat. *VORTEX*, a simulation software package written for population viability analysis, was used here as a mechanism to study the interaction of a number of Malay tapir life history and population parameters treated stochastically, to explore which demographic parameters may be the most sensitive to alternative management practices, and to test the effects of selected island-specific management scenarios.

The *VORTEX* package is a Monte Carlo simulation of the effects of deterministic forces as well as demographic, environmental, and genetic stochastic events on wild populations. *VORTEX* models population dynamics as discrete sequential events (e.g., births, deaths, sex ratios among offspring, catastrophes, etc.) that occur according to defined probabilities. The probabilities of events are modeled as constants or random variables that follow specified distributions. The package simulates a population by stepping through the series of events that describe the typical life cycles of sexually reproducing, diploid organisms.

VORTEX is not intended to give absolute answers, since it is projecting stochastically the interactions of the many parameters used as input to the model and because of the random processes involved in nature. Interpretation of the output depends upon our knowledge of the biology of the Malay tapir, the environmental conditions affecting the species, and possible future changes in these conditions. For a more detailed explanation of *VORTEX* and its use in population viability analysis, refer to a brief description in Appendix I as well as Lacy (2000) and Miller and Lacy (2003).

Issues

The group identified and then prioritized the most important issues for Malay tapir conservation (Criterion: To provide greatest values to action planning process):

Lack of understanding of basic tapir biology and how threats impact them

1. Absence of tapir specialists
    - Tapirs are not a sexy species, so it is difficult to obtain funding
    - Tapirs are not a cause for concern among local populations
        - largely seen as pigs (country specific)?
        - not considered threatened
    - Tapirs are difficult to study… are they worth the effort?

2. Understanding of basic tapir biology & how humans impact it
    - Improve management effectiveness with better monitoring
    - Conduct better risk analysis - identify threats
    - Not much demographic data

Evaluation of alternative management scenarios

3. To maintain healthy populations where they exist
    - What criteria do we use to prioritize habitat areas for management?
    - What is a "healthy population"?

4. To restore extirpated populations
    - How viable is this option with limited resources?
    - How do we prioritize areas for restoration?
    - Taxon restrictions for restoration?

Data ownership and coordination

5. Data ownership issues - Reluctance to share data without official request and acknowledgement
6. Coordination between field researchers and zoo biologists; and between field biologists and park managers

Understand primary threat factors

7. Regional specificity

Input Parameters for Simulation Modeling

Scenario settings

Duration of simulation: We opted to use a time span of 100 years because it is far enough into the future so as to decrease the chances of omitting a yet unknown event, but also not too short to fail to observe a slowly developing event.

Species description

Definition of extinction: We have defined extinction to mean the total removal of at least one sex. In other words, we are not looking at the decline of the population below some threshold size (otherwise known as quasi-extinction).

Inbreeding depression: *VORTEX* includes the ability to model the detrimental effects of inbreeding through reduced survival of offspring through their first year. We do not have any evidence of

inbreeding depression from wild or captive tapir populations, so we have decided to exclude this effect from the current set of analyses. However, we recognize its potential importance as population size continues to decline and we may decide to investigate its effects in additional PVA modeling efforts in the future.

Concordance of environmental variation (EV) between reproductive rates and survival rates: No evidence of such concordance exists in tapirs. Baird's tapirs in Corcovado National Park, Costa Rica, kept breeding throughout the last severe droughts of El Niño in 1997/98 (Charles Foerster, pers. obs.). Other lines of evidence also support this assumption; large, long-lived and slow-growing animals show little correlation between breeding and survival.

Reproductive system

Breeding system: Monogamous. Although current direct and indirect evidence from field studies (in the Americas) and camera traps (Sumatra and Peninsular Malaysia) indicate that tapirs are not monogamous and probably facultatively polygynous, we parameterized it as monogamous because *VORTEX* is not spatially explicit and the selection of a polygynous system would suggest a panmictic scenario, which is less similar to what current data suggest than monogamy.

Age of first reproduction: *VORTEX* precisely defines reproduction as the time at which offspring are born, not simply the age of sexual maturity. The program uses the mean age rather than the earliest recorded age of offspring production. Age of first reproduction was assumed to be 5 years for both females and males. Data from captive populations show that tapirs reach sexual maturity at an average of 3.70 years. The earliest recorded conception at Saint Louis Zoo has been at 36 months (3 years), although females have bred as early as 31-32 months of age (Read 1986). According to Wilson and Wilson (1973), the earliest known matings in captivity are 3 years for males, and average 2.8 (range = 2.3 to 3) years for females. Female Baird's tapirs in the wild reach sexual maturity at 2 to 3 years of age, and males at 3 (Williams 1991). We assume that natural situations will impose a toll on growth and achieving sexual maturity, and thus assume that both sexes are capable of siring their first offspring at year 5.

Maximum age of reproduction: *VORTEX* initially assumes that animals can reproduce (at the normal rate) throughout their adult life. We set this maximum age at 24 years. According to Robinson and Redford (1986), the average age of last reproduction for tapirs is 23.5 years. The only available data is on longevity, with 29.3 years as the record from the Dallas zoo (Yin 1967). As a conservative estimate, the tapirs are modeled to live and reproduce up until 24 years.

Longevity: Data from the Dallas Zoo indicate 29.3 years (Yin 1967). According to MacKinnon (1985), the lifespan of a Malay tapir is about 30 years.

Maximum number of offspring per year: Tapirs have a gestation period of about 401 days (13.4 months), range from 390 to 407, and rarely do females give birth to more than one young per gestation (Read 1986; Barongi 1986). Adult females generally produce one calf, and rarely two, every two years (Anderson 1982; Lekagul and McNeely 1977). Even though there is at least one record of twins born in a zoo (Dr. Vellayan pers. comm.), tapirs produce 1 calf per parturition.

Sex ratio at birth: Sex ratio at birth is assumed to be 50%. There is no *a priori* evidence to suggest a skewed sex ratio at birth. Field data from Corcovado National Park shows a larger (although not significant) percent of males (Charles Foerster, pers. obs.). Zoo records from the Zoo Negara in Malaysia show birth rates with a 50% sex ratio (Dr. Vellayan pers. comm.).

Female breeding success: We assume that, on average, about 60% of adult females will successfully breed each year. Data on gestation and lactation comes mainly from Read (1986), which would suggest that inter-birth interval in captivity is 18.5 months (554 days; range = 496 to 602) (or 50% of females available in any given year). Other zoo evidence and field observations in Corcovado National Park (Charles Foerster, pers. obs.) indicate that females may become pregnant while lactating, which can reduce the interval to as few as 16 months (4 female Baird's tapirs, 4-9 years observations). Further, some females may lose their offspring during lactation, stillbirth, or neonatal deaths and come into estrus sooner afterward. The model assumes 60% females reproducing in a given year to account for an inter-birth interval of app. 20 months.

Density dependent reproduction: Density dependence is here assumed only in the case of an Allee effect at very low densities, where finding mates may be very difficult. Lacking any information on the subject, the effect is modeled to cause a sharp decline in reproductive rates when density drops below 10% of carrying capacity (K).

Reproductive rates

Environmental variation in breeding: Annual environmental variation in female reproduction is modeled in *VORTEX* by specifying a standard deviation (SD) for the proportion of adult females that successfully produce offspring within a given year. No data are available for this parameter. Given their body size and reproductive rate, it is expected that Malay tapirs show very little variation, just as in their American siblings (Robinson and Redford 1986). Assuming no variation in breeding may be less realistic than assuming a small variation. Thus, 10% of the initial rate, or 6%EV, is considered as a small value and used in the simulation.

Mortality rates

No data exist on mortality rates for Malay tapirs, and only limited data have been collected for Baird's tapir by Charles Foerster in Corcovado National Park. Four lines of evidence can be used to assume realistic rates (see Salas and Kim 2002). First, the mortality schedule must follow a Type I pattern. Second, using allometric regressions of body mass and life history parameters, Robinson and Redford (1986) placed the American tapirs in a category of animals with 20% or less survival to age of last reproduction. Malay tapirs should be expected to follow this pattern. Thirdly, the population should show a growth rate between r = 3% to r = 6%, as expected from allometric relationships (Robinson and Redford 1986). Finally, zoo keepers attending the workshop report relatively high expected mortality of newborns, and Charles Foerster reports evidence of risk-prone behavior in sub-adults (ages 3-5). Furthermore, we assumed mortality rates would be equivalent between males and females.

Based on the above information, the survival rates were set at:

Mortality from age 0 to 1	10% (SD = 2%)
Mortality from age 1 to 2	10% (SD = 3%)
Mortality from age 2 to 3	15% (SD = 3%)
Mortality from age 3 to 4	20% (SD = 5%)
Mortality from age 4 to 5	20% (SD = 5%)
Annual Mortality after age 4	5% (SD = 1%)

With the above values, the survival probability to age of last reproduction is 16.6% and r = 4%.

Mate monopolization

In many species, some adult males may be socially restricted from breeding despite being physiologically capable. This can be modeled in *VORTEX* by specifying a portion of the total pool of adult males that may be considered "available" for breeding each year. Again, no data are available on this parameter for Malay tapirs. Evidence from Baird's tapirs in Corcovado National Park (Charles Foerster, pers. obs.) clearly shows a territorial behavior and males securing access to only 1 female. Data from lowland tapirs in Morro do Diabo State Park, Brazil (Patrícia Medici, pers. obs.) show a different behavior. Camera trap records for Malay tapirs show no evidence of herding. Therefore, no monopolization is assumed (i.e., 100% of the males enter the breeding pool).

Initial population size and carrying capacity

The population is initialized at 60% K by setting the initial value at 300 individuals and setting K at 500 individuals. *VORTEX* distributes the specified initial population among age-sex classes according to a stable age distribution that is characteristic of the mortality and reproductive schedule described previously. In addition the carrying capacity, K, for a given habitat patch defines an upper limit for the population size, above which additional mortality is imposed randomly across all age classes in order to return the population to the value set for K.
We also assumed that the carrying capacity could vary randomly from year to year, expressed as a standard deviation in K of 5%. This is a low value and may reflect more accurately the reality of the environments in the Malay tapir's range instead of no variation.

Results from Simulation Modeling

Results I: Baseline Model and Demographic Sensitivity Analysis

Table 1 below shows a summary of the baseline model input data and the results of the sensitivity analysis. In this table, the results are expressed in terms of the stochastic growth rate produced by the combination of demographic input parameters and their degree of annual variation. The input for our baseline model – that scenario which includes our best "guesstimates" of the input parameters that describe Malay tapir population biology – is summarized in column B of Table 1, while the stochastic growth rate is shown in column C-E. Given this, we see that the growth rate produced from this simulation is 4% (0.04) per year. This is within the range expected based on the mortality and fecundity values used in the model, giving us a reasonable level of confidence in our estimates of demographic input.

Despite this confidence, there are a number of parameters that are estimated with a great deal of uncertainty. It is important for us to evaluate the impact of that uncertainty on the performance of our model in order to identify some of those demographic parameters that appear to drive population growth and, therefore, are priority targets for field research or intensive conservation management.

The parameters we identified as highly uncertain include:

- Maximum age of reproduction – baseline value = 24 years, min – max = 22 – 28
- Percentage of females breeding annually – baseline = 60%, min – max = 40 – 65
- Sex ratio at birth – baseline value = 50%, min – max = 45 – 60
- Intensity of Allee effect (value of Allee parameter) – baseline value = 2.5, min – max = 1.5 – 3.5
- Age-specific mortality – see table below for specific baseline and min – max values

Column A	B	C	D	E	F
		Growth rate (%)			
Parameter	**Value (Range)**	**Low**	**Base**	**High**	**Confidence rating**
Age of first offspring for females (years)	5		4		4
Age of first offspring for males (years)	5		4		3.5
Maximum age of reproduction (years)	24 (22 - 28)	3.7	4	4.5	2.5
Maximum number of progeny per year	0.6 (0.4 - 0.65)	2.4	4	4.8	4
Sex ratio at birth - in % males	50% (45 - 60)	4.7	4	2.2	4
Density dependent reproduction	YES		4		2.5
% breeding at low density P(0)	60%		4		3.5
% breeding at carrying capacity P(K)	60%		4		3.5
Inter-birth interval:	20 months		4		3.5
zoo data: 554 days to 2 years					
16.4 months, based on 4 female Baird's tapirs, 4-9 years observations, may be high estimate					
Assumption 20 months, if % females breeding = 60%					
Allee effect (N/K = 0.2)	2.5 (1.5 - 3.5)	4,2	4	2.8	2
EV in % breeding	1%		4		4
Mortality males & females					
Mortality from age 0 to 1 (+/- 2%)	10% (5 - 15)	4.50	4	3.60	2.5
Mortality from age 1 to 2 (+/- 3%)	10% (5 - 15)	4.60	4	3.60	2.5
Mortality from age 2 to 3 (+/- 3%)	15% (10 - 20)	4.50	4	3.60	2.5
Mortality from age 3 to 4 (+/- 5%)	20% (15 - 25)	5.10	4	3.50	2.5
Mortality from age 4 to 5 (+/- 5%)	20% (15 - 25)	5.10	4	3.50	2.5
Annual Mortality after age 5 (+/- 1%)	5% (3 - 7)	4.70	4	2.90	2.5
% Males in breeding pool (data entered)	100%		4		
Initial population size	300		4		
Carrying capacity (K)	500		4		

Table 1. Malay tapir demographic sensitivity analysis. *VORTEX* simulation model input parameters including range of tested values, results expressed as annual rates of stochastic population growth, and an arbitrary numerical score indicating the degree of confidence in the state baseline input parameter. See text for additional details. Highlighted rows indicate parameters for which the model shows high sensitivity.

Given these alternative parameter values, we then developed an additional 20 models that differed from the baseline by a single variable among those identified above. The stochastic growth rates for these sensitivity models are given in columns C-E of Table 1. For example, we see a growth rate of 4.7% when adult mortality (after 5 years of age) is reduced from the baseline value of 0.05 to the minimum value of 0.03. Similarly, the growth rate declines to 2.9% when adult mortality is increased from 0.05 to 0.07. Using this same process and with the same interpretation, we can identify those tested variables that lead to the greatest variability in growth rate across the studied range: number of progeny per female per year, sex ratio of offspring at birth, intensity of density-dependent reproduction at low densities, and annual adult mortality.

Highlighted rows indicate parameters for which the model shows high sensitivity. The values used for the bottom two sensitive parameters – the Allee parameter and adult mortality – are highly uncertain. Unfortunately field data are not currently available and will not be available in the near future. Average confidence score for the entire dataset is 3.06 on a scale from 1 to 5.

Results II: General Risk Analysis

a.) Population size and impact on population persistence - Extinction
b.) Population size – Hunting
c.) Metapopulation Dynamics
    Age - specific
    Sex - specific
    Cost to dispersal

An important input to our knowledge of the status of Malaysian tapir populations comes from an understanding of their resilience under various abundances and hunting/extraction pressures in the face of demographic and environmental stochasticity. This latter stochastic threat is considered to be proportionally small compared to habitat loss and extraction.

Several experts attending this workshop have remarked that tapirs are under no hunting threat in many parts of their range. Notably, active hunting for consumption occurs in the border areas between Malaysia and Thailand, where nomadic groups of incense wood harvesters occupy parts of the forest while harvesting the wood. Minimal hunting may occur among traditional people in Sumatra as well, as reported in the literature. Indigenous people in the Tenassirims area of Myanmar may also hunt tapirs for subsistence, and tapir meat has been documented to finds its way to markets in Laos.

Extraction, although incidental, also happens through road kills after the constructions of new roads. Many experts have also noted the deaths of tapirs in unknown numbers, victims of snares and traps intended to capture other prey (such as tigers and deer).

The simulations were conducted by considering seven population sizes and six extraction scenarios. To cover a range similar to possible population sizes in the wild, the population sizes simulated were: 10, 20, 50, 100, 500, 1000 and 2000 individuals. Because extraction seems to be largely unintentional throughout the Malaysian tapir's range, extraction values were simulated at low levels: 0%, 5%, 10%, 15%, 20% and 25%. Several authors have argued that tapir populations should be very sensitive to extraction and be able to sustain only low extraction levels (Robinson and Redford 1991).

Demographic stochasticity alone makes small population sizes highly susceptible to extinction, as shown in Figure 1 below. Under the demographic conditions modeled during this workshop, simulated Malay tapir populations were able to remain free from extinction risk in the absence of extraction only if their numbers were moderate to large (50 or more). These results reflect the representation of stochasticity in life history traits included in the simulation, which were conservatively appraised in this exercise.

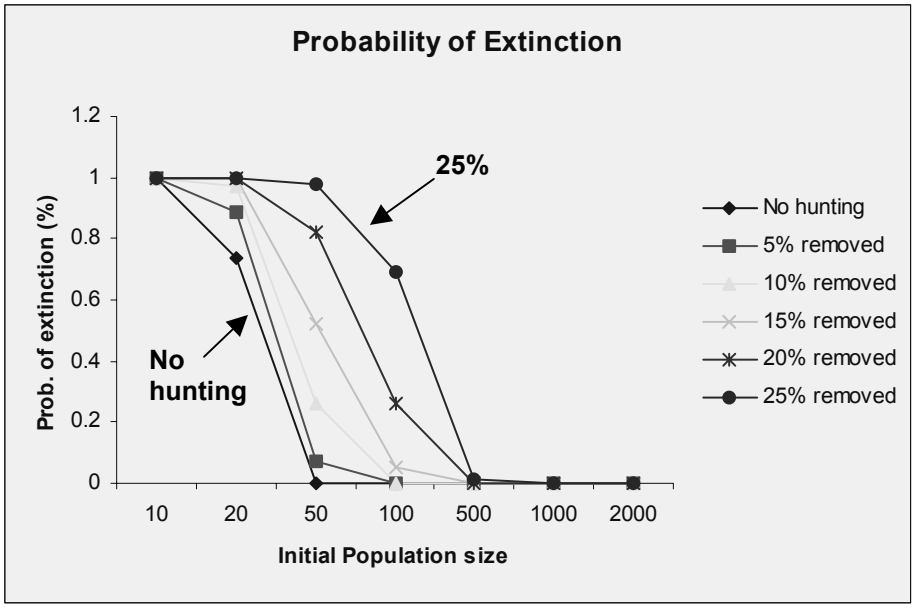


Figure 1. Malay tapir population viability analysis: Impact of hunting on 100-year extinction risk. All models initialized with baseline demographic values, with hunting pressure imposed as additional mortality risk. See text for additional details.

If the populations are under hunting/extraction pressure, the numbers needed to maintain low extinction risk are much larger, as much as 10 times more (500 animals). Further, in small populations a small increase in extraction levels (of only 5%) can double the chances of the population going extinct. Because both accidental and intentional extractions occur throughout the Malaysian tapir's range, and because population numbers are low at any given place, it is very likely that current populations are at high risk of extinction within the next 100 years.

The simulations conducted in this workshop also provide insight on the average growth of the populations over 100 years given the combination of population sizes and extraction rates (Figure 2). Under the "no hunting" scenario, only populations with 50 or more individuals showed a positive average growth during the entire interval. Because the demographic stochasticity represented in the exercise is conservative, it is likely that a larger number will be needed to ensure positive growth. A 10% extraction rate will require 100 individuals or more; 20% extraction levels will require more than 1000 individuals. A population of 2000 tapirs was insufficient to maintain a positive growth under 25% extraction. **The results of these simulations are in accordance with the statements in the literature: tapir populations can sustain only very small extraction rates sustainably. The above results add support to the high level of threat to extinction of Malay tapir populations.**

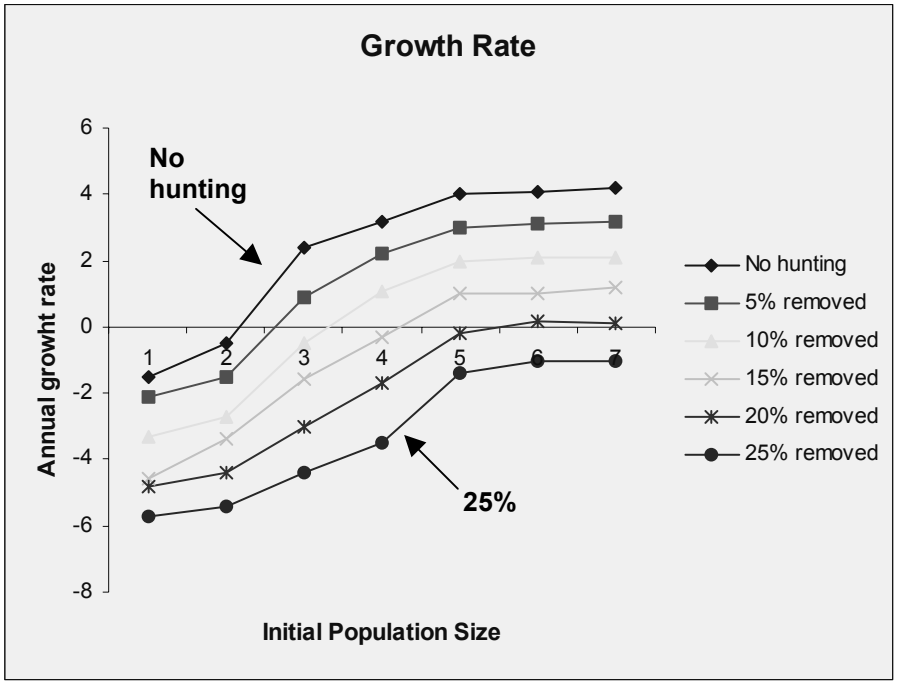


Figure 2. Malay tapir population viability analysis: Impact of hunting on stochastic population growth rate. X–axis labels 1 – 7 indicate variable initial population sizes as described in Figure 1. See text for additional details.

Loss of genetic diversity behaved similarly across all hunting scenarios, and was largely determined by the size of the initial population (Figure 3). Populations of 20 to 50 tapirs were able to retain only 60% or less of the original heterozygosity levels after 100 years. At least 500 individuals were needed to ensure no loss. **These results suggest that current population levels are at high risk of genetic erosion over the next 100 years.**

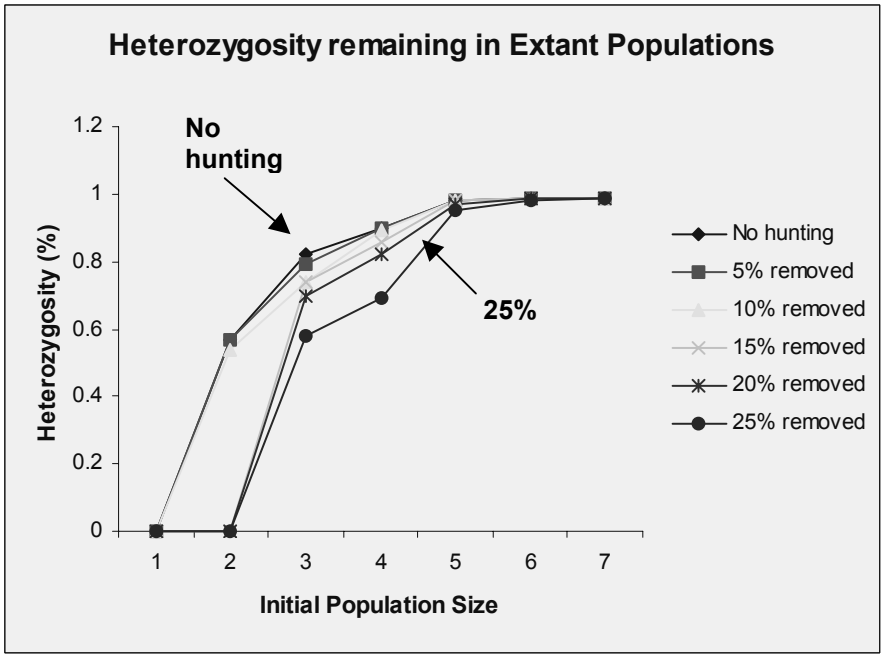


Figure 3. Malay tapir population viability analysis: Impact of hunting on retention of population heterozygosity. X–axis labels 1 – 7 indicate variable initial population size as described in Figure 1. See text for additional details.

Overall, it can be said that despite conservative values of demographic stochasticity and low extraction levels, **tapir populations must be maintained at high numbers to ensure their long-term survival, growth and genetic health. Because such high numbers are unlikely to be found throughout their range, the Malaysian tapir is under considerable threat.**

Results III: Bukit Barisan Selatan National Park Population Risk Analysis

After a more generalized analysis of Malay tapir viability as a function of population size and hunting pressure, other PHVA workshop participants suggested we investigate the viability of tapirs occupying a specific habitat remnant somewhere within the species' range where considerable data on habitat availability has been collected. Current research places habitat loss across the tapir's range as the primary threat to the persistence of the species.

Initial consideration of the viability of Malay tapirs within Indonesia's Bukit Barisan Selatan (BBS) National Park required some review of general bibliographic references on tapir population density. These data are summarized below.

- Robinson and Redford (1991): Carrying capacity for Lowland tapirs (Peruvian Amazon) = 1.61 ind./km²
  Sustainable annual harvest level = 0.03 ind./km²

- Williams andPetrides (1980)
  Taman Negara National Park, Malaysia
  Area = 4,343 km²
  Home Range = 12.75 km² (1 male ind. - radio-telemetry)
  Density = 0.08 ind./km² = 340 animals

- Santiapillai and Ramono (1990)
  Way Kambas National Park, Sumatra, Indonesia
  Area = 123,000 hectares = 1,230 km²
  Density = 0.16 ind./km² = 200 animals

- Blouch (1984) Southern Sumatra, Indonesia
  Undisturbed swamp forests and lowland forests
  Density = 0.30 - 0.44 ind./km²

- Sanborn and Watkins (1950) Thailand
  9 ind. / Area = 256 km² / Density = 0.035 ind./km²

- Eisenberg (1990) 0.80 ind./ km²

Some information is available on the current status of Bukit Barisan Selatan National Park, its forest cover, land cover types, and deforestation rates (Kinnaird *et al.* 2003). The researchers used GIS data on land cover from 5 previous years, spanning 1985 to 1999, to build a projection of land cover for 2010. O'Brien *et al.* (2003) also document threats and possible densities of tapirs and other large mammals within BBS.

1985	1,273 km²	lowland rainforest
	1,871 km²	total forested area
	56 km²	elephant core area
	955 km²	tiger and rhino core area
1999	928 km²	lowland rainforest
	1,209 km²	total forested area
	13,6 km²	elephant core area
	525 km²	tiger and rhino core area
2010	654 km²	lowland rainforest
	707 km²	total forested area
	0.3 km²	elephant core area
	148 km²	tiger and rhino core area

For the purposes of this analysis, we assume that tapirs are affected by edge similar to elephants. Tapirs sometimes use edge habitats.

Based on this information, we developed the following plausible scenarios for the extent of available tapir habitat within BBS in 1985:

a.) good elephant habitat = good tapir habitat = 56 km²
b.) good tiger/rhino habitat = good tapir habitat = 1,000 km²
c.) total forested area = 1,900 km²

Using Nowak's general density estimate of 0.8 tapirs/ km²:
Eisenberg (1990) ???

a.) N = 45
b.) N = 800
c.) N = 1,500

Using Santiapialli's estimate of 0.3 to 0.4 tapirs/ km²:
Lowland forest, intact and good quality

a.) N = 23
b.) N = 400
c.) N = 750

Highland estimate of 0.02 tapirs/ km²:
Lowland forest gone… upland forest remains

a.) N = 1
b.) N = 20
c.) N = 95

If we begin with the estimated habitat availability in 1999, we arrive at the following estimates of tapir numbers in the Park:

a.) Elephant habitat = 14 km²	$N_0 = K = 6$	density 0.4
K 1.2 km²/year	$N_0 = K = 11$	density 0.8

	12 years = 0	$N_0 = K = 0$	density 0.02
b.)	Tiger/rhino habitat = 525 km²	$N_0 = K = 210$	density 0.4
	K 34 km²/year	$N_0 = K = 420$	density 0.8
	16 years = 0	$N_0 = K = 11$	density 0.02
c.)	Lowland forest = 928 km²	$N_0 = K = 371$	density 0.4
	K 25 km²/year	$N_0 = K = 742$	density 0.8
	37 years = 0	$N_0 = K = 19$	density 0.02
d.)	Total forest = 1,209 km²	$N_0 = K = 484$	density 0.4
	K 46 km²/year	$N_0 = K = 967$	density 0.8
	26 years = 0	$N_0 = K = 24$	density 0.02

The above information and resulting analysis was used to develop six scenarios of a single population of tapirs in the park. The six scenarios represent all combinations of the present tapir populations within all lowland forest remaining in the park (928 km^2) and within all the suitable tiger/rhino forest cover (525 km2) assuming three possible densities: 0.05, 0.1 and 0.4 individuals/km^2. The first density estimate was obtained from camera trap estimates in BBS (O'Brien *et al.* 2003) and in Krau Wildlife Reserve, Malaysia (Carl Traeholt, pers. comm.). The last estimate comes from Blouch (1984). An intermediate value was used as a compromise between these two extremes and does not reflect data or any published account.

To simulate the risk of extinction of tapirs in BBS, the rates of forest disappearance reported by Kinnaird *et al.* (2003) were converted into numbers of tapirs lost per year given a particular density estimate, as indicated in the table below.

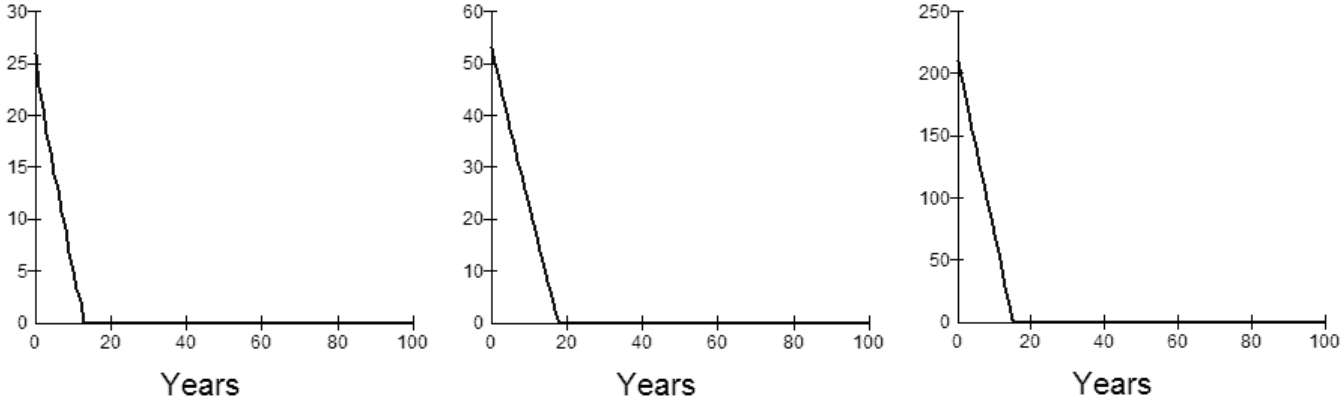
Table 2. Number of tapirs in Bukit Barisan Selatan National Park, Sumatra based on current estimates of habitat availability and historical rates of forest loss. See text for explanation and sources of values.

		Lowland forest = 926 km^2	Tiger/rhino habitat = 525 km^2
	Rate of forest loss	25 km^2/year	34 km^2/year
Density (#lost/year)	0.05 ind./km2	46 tapirs (1.25 lost/year)	26 tapirs (1.7 lost/year)
	0.1 ind./km2	93 tapirs (3 lost/year)	53 tapirs (3.4 lost/year)
	0.4 ind./km2	371 tapirs (10 lost/year)	210 tapirs (14 lost/year)

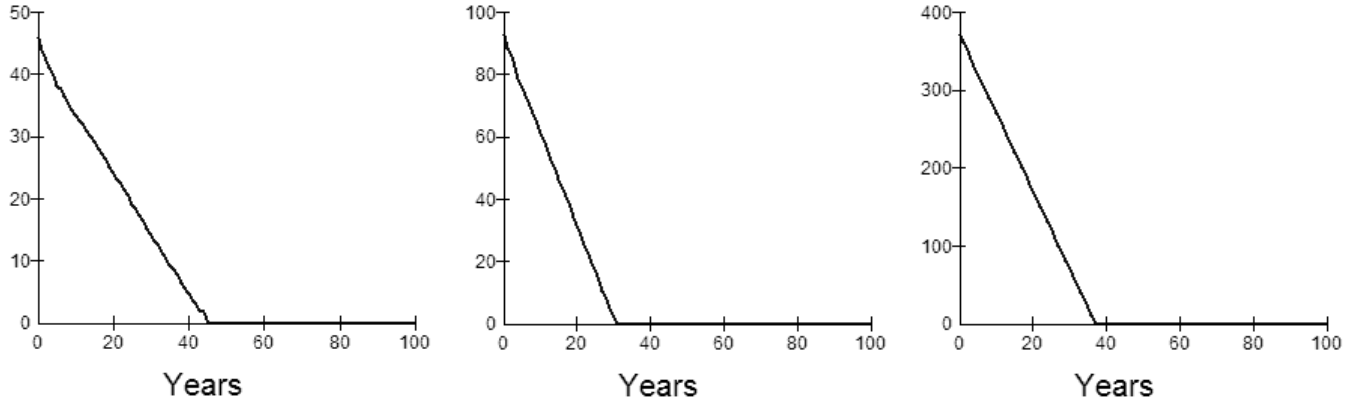
As Kinnaird *et al.* (2003) state, no forests will be left in BBS for wildlife to survive if the current rates of forest loss continue for the next 50 years. It is not surprising, therefore, that none of the simulations produced a population surviving until the last forest patches were lost. The simulated populations essentially follow a deterministic rate of decline, although demographic stochasticity causes the populations to become extinct some years before all the forest disappears. Indeed, no simulation ran beyond 40 years.

Figure 4. Malay tapir population viability analysis: Impact of forest habitat loss on population size and persistence. Plots show projected size of simulated Malay tapir populations using baseline demographic input parameters and initial population sizes for 1999 based on estimates of tapir density and available habitat under three different scenarios of tapir habitat preference. See text for additional details.

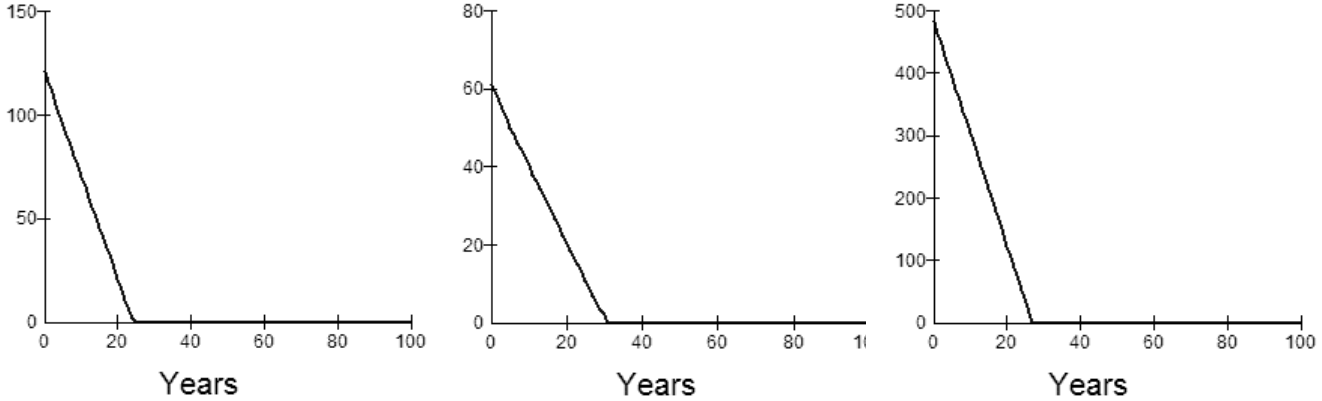
A. Tiger / Rhino habitat: 525 km^2; Habitat loss rate: 34 km^2/year



B. Lowland forest habitat: 928 km^2; Habitat loss rate: 25 km^2/year



C. Total forest available: 1209 km^2; Habitat loss rate: 46 km^2/year



The forest cover in protected areas in Sumatra, at least in paper, extends to as much as 39,000 km^2. If the conditions for BBS are representative of the forests hosting tapirs in Sumatra, **there may be between 3,000 and 900 tapirs left in the island. A Conservation Assessment and Management Plan conducted in 1994 reports no more than 3,000 tapirs living in the entire distribution range, including peninsular Malaysia, Thailand and Myanmar. Experts attending the present workshop concur on a value of numbers of tapirs for the island of Sumatra on the lower end of the above range. Regardless of the present numbers of tapirs in Sumatra, current deforestation rates will clearly ensure extinction within 50 years or less.**

Goals and Recommended Actions

Issue 1
Lack of understanding of basic tapir biology and how threats impact them

Goal 1
Develop a greater understanding of basic tapir biology and how human activities impact those processes.

Actions

1. Design and implement two detailed field studies (Sumatra and Peninsular Malaysia) to generate more precise estimates of selected demographic parameters: Density and Survival rates (primarily of adults).
   Description: Telemetry would be used to conduct the study. Consider tracking 40 radio-collared animals (20/20) for a minimum of five (5) years, preferably 10.
   Responsibility: Sumatra: Leonardo Salas - Wilson Novarino - Researcher, Institution? Malaysia: Carl Traeholt and Siti Khadijah
   Timeline: Two (2) years with fundraising
   Outcome: More precise estimates of focal demographic parameters (μ, SD)
   Partners: Local universities, NGOs
   Resources: Two coordinators; 2 researchers (US$75,000); equipment (US$100,000); 4 assistants (US$50,000)
   Total = US$250,000.
   Consequences: Improved ability to conduct population analysis and risk assessments.
   Obstacles: Funding, lack of interest, permit bureaucracy, political instability.

2. Improve/complement our database on distribution of Malay tapirs throughout their range.
   Description: Identify the presence and absence of tapirs in selected forest patches were no information is now present: a.) map of forest cover (generated by the database); b.) select patches needed to be studied; c.) conduct interviews/send questionnaires to knowledgeable people; d.) for those sites still without data conduct field verifications looking for tapir signs.
   Responsibility: TSG membership in Southeast Asia.
   Timeline: Three (3) years.

Outcome: More accurate distribution map of the species.
Partners: Parks personnel, NGOs, non-tapir research projects etc.
Resources: US$ 25,000
Consequences: Better understanding of the range of the species and levels of isolation of small populations.
Obstacles: Communications, permits, access to the areas etc.

3. Design and implementation of a study to evaluate the genetic diversity of Malay tapirs throughout their range.
   Description: Develop a sample collection protocol for genetic samples and analyze differences in genetic diversity between and within different populations of different sizes.
   Responsibility: TSG membership in Southeast Asia.
   Timeline: Two (2) years for permits and protocol design.
   Outcome: A better assessment of the genetic health for Malay tapirs and the identification of management decisions.
   Partners: Columbia University, Local labs and universities etc.
   Resources: US$130,000
   Consequences: Prioritization of management strategies.
   Obstacles: Funding, permits, storage and transport of samples etc.

4. Assessment of the level of extraction of Malay tapirs (hunting, by-catch, road kills, etc).
   Description: Conduct interviews/questionnaires to collect info on incidental deaths.
   Responsibility: TSG members Southeast Asia
   Timeline: 1 year
   Outcome: Better understanding of causes and rates of mortality
   Partners: Parks personnel, universities
   Resources: US$8,000
   Consequences: Better appraisal of risk of extinction of Malay tapir.
   Obstacles: Communication; disclosure of information.

Issue 2
Evaluation of alternative management scenarios.

Goal 2
<u>To secure the best available data to ensure the most appropriate management of Malay tapir populations.</u>

Actions

1. Periodic supplement of results from long-term studies into Malay tapir database.
   Description: Ensure that results from ongoing long-term studies are communicated to included into the Malay tapir database.
   Responsibility: TSG members Southeast Asia
   Timeline: 1 year
   Outcome: Better understanding of causes and rates of mortality

Partners: Parks personnel, universities
Resources: US$8,000
Consequences: Better appraisal of risk of extinction of Malay tapir.
Obstacles: Communication; disclosure of information.

Appendix I:
Simulation Modeling and Population Viability Analysis

Jon Ballou – Smithsonian Institution / National Zoological Park
Bob Lacy – Chicago Zoological Society
Phil Miller – Conservation Breeding Specialist Group (IUCN / SSC)

A model is any simplified representation of a real system. We use models in all aspects of our lives, in order to: (1) extract the important trends from complex processes, (2) permit comparison among systems, (3) facilitate analysis of causes of processes acting on the system, and (4) make predictions about the future. A complete description of a natural system, if it were possible, would often decrease our understanding relative to that provided by a good model, because there is "noise" in the system that is extraneous to the processes we wish to understand. For example, the typical representation of the growth of a wildlife population by an annual percent growth rate is a simplified mathematical model of the much more complex changes in population size. Representing population growth as an annual percent change assumes constant exponential growth, ignoring the irregular fluctuations as individuals are born or immigrate, and die or emigrate. For many purposes, such a simplified model of population growth is very useful, because it captures the essential information we might need regarding the average change in population size, and it allows us to make predictions about the future size of the population. A detailed description of the exact changes in numbers of individuals, while a true description of the population, would often be of much less value because the essential pattern would be obscured, and it would be difficult or impossible to make predictions about the future population size.

In considerations of the vulnerability of a population to extinction, as is so often required for conservation planning and management, the simple model of population growth as a constant annual rate of change is inadequate for our needs. The fluctuations in population size that are omitted from the standard ecological models of population change can cause population extinction, and therefore are often the primary focus of concern. In order to understand and predict the vulnerability of a wildlife population to extinction, we need to use a model which incorporates the processes which cause fluctuations in the population, as well as those which control the long-term trends in population size (Shaffer 1981). Many processes can cause fluctuations in population size: variation in the environment (such as weather, food supplies, and predation), genetic changes in the population (such as genetic drift, inbreeding, and response to natural selection), catastrophic effects (such as disease epidemics, floods, and droughts), decimation of the population or its habitats by humans, the chance results of the probabilistic events in the lives of individuals (sex determination, location of mates, breeding success, survival), and interactions among these factors (Gilpin and Soulé 1986).

Models of population dynamics which incorporate causes of fluctuations in population size in order to predict probabilities of extinction, and to help identify the processes which contribute to a population's vulnerability, are used in "Population Viability Analysis" (PVA) (Lacy 1993/4). For the purpose of predicting vulnerability to extinction, any and all population processes that impact population dynamics can be important. Much analysis of conservation issues is conducted by largely intuitive assessments by biologists with experience with the system. Assessments by experts can be quite valuable, and are often contrasted with "models" used to evaluate population vulnerability to extinction. Such a contrast is not valid, however, as *any* synthesis of facts and understanding of processes constitutes a model, even if it is a mental model within the mind of the expert and perhaps only vaguely specified to others (or even to the expert himself or herself).

A number of properties of the problem of assessing vulnerability of a population to extinction make it difficult to rely on mental or intuitive models. Numerous processes impact population dynamics, and many of the factors interact in complex ways. For example, increased fragmentation of habitat can make it more difficult to locate mates, can lead to greater mortality as individuals disperse greater distances across unsuitable habitat, and can lead to increased inbreeding which in turn can further reduce ability to attract mates and to survive. In addition, many of the processes impacting population dynamics are intrinsically probabilistic, with a random component. Sex determination, disease, predation, mate acquisition -- indeed, almost all events in the life of an individual -- are stochastic events, occurring with certain probabilities rather than with absolute certainty at any given time. The consequences of factors influencing population dynamics are often delayed for years or even generations. With a long-lived species, a population might persist for 20 to 40 years beyond the emergence of factors that ultimately cause extinction. Humans can synthesize mentally only a few factors at a time, most people have difficulty assessing probabilities intuitively, and it is difficult to consider delayed effects. Moreover, the data needed for models of population dynamics are often very uncertain. Optimal decision-making when data are uncertain is difficult, as it involves correct assessment of probabilities that the true values fall within certain ranges, adding yet another probabilistic or chance component to the evaluation of the situation.

The difficulty of incorporating multiple, interacting, probabilistic processes into a model that can utilize uncertain data has prevented (to date) development of analytical models (mathematical equations developed from theory) which encompass more than a small subset of the processes known to affect wildlife population dynamics. It is possible that the mental models of some biologists are sufficiently complex to predict accurately population vulnerabilities to extinction under a range of conditions, but it is not possible to assess objectively the precision of such intuitive assessments, and it is difficult to transfer that knowledge to others who need also to evaluate the situation. Computer simulation models have increasingly been used to assist in PVA. Although rarely as elegant as models framed in analytical equations, computer simulation models can be well suited for the complex task of evaluating risks of extinction. Simulation models can include as many factors that influence population dynamics as the modeler and the user of the model want to assess. Interactions between processes can be modeled, if the nature of those interactions can be specified. Probabilistic events can be easily simulated by computer programs, providing output that gives both the mean expected result and the range or distribution of possible outcomes. In theory, simulation programs can be used to build models of population dynamics that include all the knowledge of the system which is available to experts. In practice, the models will be simpler, because some factors are judged unlikely to be important, and because the persons who developed the model did not have access to the full array of expert knowledge.

Although computer simulation models can be complex and confusing, they are precisely defined and all the assumptions and algorithms can be examined. Therefore, the models are objective, testable, and open to challenge and improvement. PVA models allow use of all available data on the biology of the taxon, facilitate testing of the effects of unknown or uncertain data, and expedite the comparison of the likely results of various possible management options.

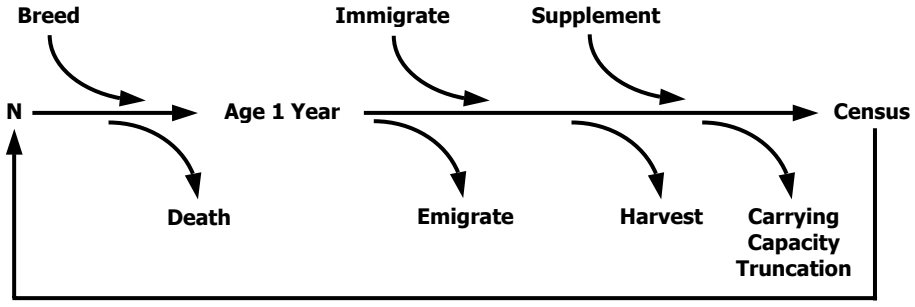
PVA models also have weaknesses and limitations. A model of the population dynamics does not define the goals for conservation planning. Goals, in terms of population growth, probability of persistence, number of extant populations, genetic diversity, or other measures of population performance must be defined by the management authorities before the results of population modeling can be used. Because the models incorporate many factors, the number of possibilities to test can seem endless, and it can be difficult to determine which of the factors that were analyzed are most important to the population dynamics. PVA models are necessarily incomplete. We can model only those factors which we understand and for which we can specify the parameters. Therefore, it is important to realize that the models probably underestimate the threats facing the population. Finally, the models are used to predict

the long-term effects of the processes presently acting on the population. Many aspects of the situation could change radically within the time span that is modeled. Therefore, it is important to reassess the data and model results periodically, with changes made to the conservation programs as needed (see Lacy and Miller (2002), Nyhus et al. (2002) and Westley and Miller (in press) for more details).

The *VORTEX* Population Viability Analysis Model

For the analyses presented here, the *VORTEX* computer software (Lacy 1993a) for population viability analysis was used. *VORTEX* models demographic stochasticity (the randomness of reproduction and deaths among individuals in a population), environmental variation in the annual birth and death rates, the impacts of sporadic catastrophes, and the effects of inbreeding in small populations. *VORTEX* also allows analysis of the effects of losses or gains in habitat, harvest or supplementation of populations, and movement of individuals among local populations.

VORTEX Simulation Model Timeline



Events listed above the timeline increase N, while events listed below the timeline decrease N.

Density dependence in mortality is modeled by specifying a carrying capacity of the habitat. When the population size exceeds the carrying capacity, additional morality is imposed across all age classes to bring the population back down to the carrying capacity. The carrying capacity can be specified to change linearly over time, to model losses or gains in the amount or quality of habitat. Density dependence in reproduction is modeled by specifying the proportion of adult females breeding each year as a function of the population size.

VORTEX models loss of genetic variation in populations, by simulating the transmission of alleles from parents to offspring at a hypothetical genetic locus. Each animal at the start of the simulation is assigned two unique alleles at the locus. During the simulation, *VORTEX* monitors how many of the original alleles remain within the population, and the average heterozygosity and gene diversity (or "expected heterozygosity") relative to the starting levels. *VORTEX* also monitors the inbreeding coefficients of each animal, and can reduce the juvenile survival of inbred animals to model the effects of inbreeding depression.

VORTEX is an *individual-based* model. That is, *VORTEX* creates a representation of each animal in its memory and follows the fate of the animal through each year of its lifetime. *VORTEX* keeps track of the sex, age, and parentage of each animal. Demographic events (birth, sex determination, mating, dispersal, and death) are modeled by determining for each animal in each year of the simulation whether any of the events occur. (See figure below.) Events occur according to the specified age and sex-specific probabilities. Demographic stochasticity is therefore a consequence of the uncertainty regarding whether each demographic event occurs for any given animal.

VORTEX requires a lot of population-specific data. For example, the user must specify the amount of annual variation in each demographic rate caused by fluctuations in the environment. In addition, the frequency of each type of catastrophe (drought, flood, epidemic disease) and the effects of the catastrophes on survival and reproduction must be specified. Rates of migration (dispersal) between each pair of local populations must be specified. Because *VORTEX* requires specification of many biological parameters, it is not necessarily a good model for the examination of population dynamics that would result from some generalized life history. It is most usefully applied to the analysis of a specific population in a specific environment.

Further information on *VORTEX* is available in Miller and Lacy (1999) and Lacy (2000).

Dealing with Uncertainty

It is important to recognize that uncertainty regarding the biological parameters of a population and its consequent fate occurs at several levels and for independent reasons. Uncertainty can occur because the parameters have never been measured on the population. Uncertainty can occur because limited field data have yielded estimates with potentially large sampling error. Uncertainty can occur because independent studies have generated discordant estimates. Uncertainty can occur because environmental conditions or population status have been changing over time, and field surveys were conducted during periods which may not be representative of long-term averages. Uncertainty can occur because the environment will change in the future, so that measurements made in the past may not accurately predict future conditions.

Sensitivity testing is necessary to determine the extent to which uncertainty in input parameters results in uncertainty regarding the future fate of the pronghorn population. If alternative plausible parameter values result in divergent predictions for the population, then it is important to try to resolve the uncertainty with better data. Sensitivity of population dynamics to certain parameters also indicates that those parameters describe factors that could be critical determinants of population viability. Such factors are therefore good candidates for efficient management actions designed to ensure the persistence of the population.

The above kinds of uncertainty should be distinguished from several more sources of uncertainty about the future of the population. Even if long-term average demographic rates are known with precision, variation over time caused by fluctuating environmental conditions will cause uncertainty in the fate of the population at any given time in the future. Such environmental variation should be incorporated into the model used to assess population dynamics, and will generate a range of possible outcomes (perhaps represented as a mean and standard deviation) from the model. In addition, most biological processes are inherently stochastic, having a random component. The stochastic or probabilistic nature of survival, sex determination, transmission of genes, acquisition of mates, reproduction, and other processes preclude exact determination of the future state of a population. Such demographic stochasticity should also be incorporated into a population model, because such variability both increases our uncertainty about the future and can also change the expected or mean outcome relative to that which would result if there were no such variation. Finally, there is "uncertainty" which represents the alternative actions or interventions which might be pursued as a management strategy. The likely effectiveness of such management options can be explored by testing alternative scenarios in the model of population dynamics, in much the same way that sensitivity testing is used to explore the effects of uncertain biological parameters.

Results

Results reported for each scenario include:
Deterministic r -- The deterministic population growth rate, a projection of the mean rate of growth of the population expected from the average birth and death rates. Impacts of harvest, inbreeding, and density dependence are not considered in the calculation. When r = 0, a population with no growth is expected; r

< 0 indicates population decline; r > 0 indicates long-term population growth. The value of r is approximately the rate of growth or decline per year.

The deterministic growth rate is the average population growth expected if the population is so large as to be unaffected by stochastic, random processes. The deterministic growth rate will correctly predict future population growth if: the population is presently at a stable age distribution; birth and death rates remain constant over time and space (i.e., not only do the probabilities remain constant, but the actual number of births and deaths each year match the expected values); there is no inbreeding depression; there is never a limitation of mates preventing some females from breeding; and there is no density dependence in birth or death rates, such as a Allee effects or a habitat "carrying capacity" limiting population growth. Because some or all of these assumptions are usually violated, the average population growth of real populations (and stochastically simulated ones) will usually be less than the deterministic growth rate.

Stochastic r -- The mean rate of stochastic population growth or decline demonstrated by the simulated populations, averaged across years and iterations, for all those simulated populations that are not extinct. This population growth rate is calculated each year of the simulation, prior to any truncation of the population size due to the population exceeding the carrying capacity. Usually, this stochastic r will be less than the deterministic r predicted from birth and death rates. The stochastic r from the simulations will be close to the deterministic r if the population growth is steady and robust. The stochastic r will be notably less than the deterministic r if the population is subjected to large fluctuations due to environmental variation, catastrophes, or the genetic and demographic instabilities inherent in small populations.

P(E) -- the probability of population extinction, determined by the proportion of, for example, 500 iterations within that given scenario that have gone extinct in the simulations. "Extinction" is defined in the VORTEX model as the lack of either sex.

N -- mean population size, averaged across those simulated populations which are not extinct.

SD(N) -- variation across simulated populations (expressed as the standard deviation) in the size of the population at each time interval. SDs greater than about half the size of mean N often indicate highly unstable population sizes, with some simulated populations very near extinction. When SD(N) is large relative to N, and especially when SD(N) increases over the years of the simulation, then the population is vulnerable to large random fluctuations and may go extinct even if the mean population growth rate is positive. SD(N) will be small and often declining relative to N when the population is either growing steadily toward the carrying capacity or declining rapidly (and deterministically) toward extinction. SD(N) will also decline considerably when the population size approaches and is limited by the carrying capacity.

H -- the gene diversity or expected heterozygosity of the extant populations, expressed as a percent of the initial gene diversity of the population. Fitness of individuals usually declines proportionately with gene diversity (Lacy 1993b), with a 10% decline in gene diversity typically causing about 15% decline in survival of captive mammals (Ralls et al. 1988). Impacts of inbreeding on wild populations are less well known, but may be more severe than those observed in captive populations (Jiménez et al. 1994). Adaptive response to natural selection is also expected to be proportional to gene diversity. Long-term conservation programs often set a goal of retaining 90% of initial gene diversity (Soulé et al. 1986). Reduction to 75% of gene diversity would be equivalent to one generation of full-sibling or parent-offspring inbreeding.

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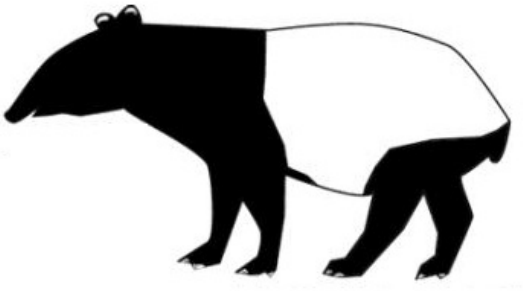
Malay Tapir Conservation Workshop

12 – 16 August 2003

National Biology Conservation Training Center
Krau Wildlife Reserve, Malaysia



Section 4
Threats to Tapirs Working Group

Threats to Tapirs Working Group Report

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General issue:
During the workshop we identified a problem in the context of developing specific action items across the different working groups. The amounts for common activities in the four working groups must be co-ordinated in order to get common ground on this issue. Otherwise external readers of the final report will not understand the background for the "budget".

Threat 1: Habitat Loss

There is a reduction in available habitat for tapirs due to various legal and illegal processes including concessions in Protected Areas, open or illegal logging, and expanding urban and cultivated areas and due to roads, powerlines, and other human infrastructure. This reduction is due to a lack of incorporation of wildlife needs in landscape level planning, lack of awareness, lack of enforcement, greed and external market forces.

Type of Loss	Malaysia	Indonesia	Thailand
Forest conversion to cultivation	Medium	High	High
Logging activity	Medium	High	High

<u>Forest Conversion to Cultivation</u>

Malaysia

- Forest conversion to agriculture is the most serious threat to the survival of tapirs. In Peninsular Malaysia oil palm and rubber are the major crops, occupying close to 40,000 km^2. The extent of forest still remaining in Peninsular Malaysia is approximately 44%; National Parks and Wildlife Reserves cover about 5%.
  (Brooks, Bodmer and Matola 1997)

Indonesia

- In Sumatra forest conversion for human settlement and agriculture such as tobacco, oil palm, and rubber is the major threat to conservation of tapirs (Santiapillai and Ramono 1989, Ramsay in litt.) Gold mining is also considered a threat. It was estimated that about 20% to 35% of the original lowland forest remained about a decade ago (Whitten et al., 1984). The trans-migration programs fro other areas is a threat in central Sumatra and elsewhere because of increased human population density and associated habitat conversion (Ramsay in litt) (Brooks, Bodmer and Matola 1997).

Thailand

- Forest cover in Thailand decreased from 57% in 1961 to under 30% in 1999 (Rabinowitz 1993; Prayurrasiddhi et al. 1999);and lowland forests which are important habitats for Malay tapirs have been heavily fragmented and lost (Lynam 1997; Pattanavibool and Dearden 2002).

<u>Logging Activity</u>

Malaysia

- Blocks of forest in Peninsular Malaysia have been gazetted as permanently reserved forest areas (32% of the land area; Laidlaw 1994). A umber of permanently reserved forest in Malaysia contain undisturbed areas of protected forest (2-2744 ha)

Indonesia

- The effects of habitat disturbance through selective logging are studied to some extent (Blouch, 1984). The results of sign counts in two areas of selectively logged lowland forest on well-drained soil I Jambi, Sumatra, seem to indicate that tapirs are more abundant in older logged forest than in recently logged forest. Along 7 km of trail through an area logged 1-3 years previously tapir signs (tracks, faces, sighting) were encountered at a rate of 0.43/km. In an area that was logged 6-8 years ago this rate was 0.73/km. It was reasoned that because tapirs are rather mobile animals in a working timber concession they probably move among the blocks of varying ages since they were logged, tending to prefer those in which vegetative succession following disturbance has proceeded longest (Meijaard, E. & N. van Strien)

- Holmes (2002) reports that 20 million ha of Indonesia's forest have been lost since 1989, at an average annual deforestation rate of 1.7 million ha. Sumatra, Indonesia's second-largest island, is experiencing the most rapid deforestation in the archipelago. Over the last 12 years, the island has lost an estimated 6.7 million ha of forest, representing a 29% lost of forest cover (Kinnaird. et al, 2002).

Thailand

- Commercial logging was banned in Thailand in 1989. However, forest loss continued to occur at an average rate of 0.7%/year during the period 1990-2000 (FAO 2000). Thailand forest cover is currently at 29% (Prayurasiddhi et al. 1999).

Myanmar

- As much as 30% of Myanmar is covered in forest (Rao et al. 2001) and deforestation is taking place at a rate of 1.4%/year (FAO 2000) but this is mostly concentrated in areas along borders with Thailand and China, and involves foreign logging companies.

Objective

No net loss of tapir habitat in core areas.

Subgoal

1. A change of attitude among locals and authorities towards use of tapir habitats.

Actions

1. To organise a seminar on Tapir conservation for GO and NGO stakeholders, zoos and universities
   Time: 2004
   Cost: $10,000 per seminar, total of $40,000 (rough estimate)
   Responsible: Tapir Specialist Group (TSG)

2. To produce and distribute leaflets about tapir conservation to the public (schools, zoos, visitor centres etc.).
   Time: 2004
   Cost: $20,000?
   Responsible: TSG

3. To implement a ”adopt a tapir” programme in relevant zoos
   Time: 2004
   Cost: ?
   Responsible: TSG

4. To approach public sector for funding of the above mentioned action steps
   Time: 2004
   Cost:
   Responsible: TSG

5. To establish a stakeholder network with the purpose of exchanging information about tapir conservation measures both nationally and internationally (among tapir range countries)
   Time: 2004 – 2005
   Cost:
   Responsible: TSG

Subgoal

2. Active enforcement of existing forest legislation relating to tapirs.

Actions

1. Nationally to establish a co-ordinating body with members from relevant governmental departments to agree upon the enforcement of rules and regulations. A meeting of CITES Management Authorities may be needed to discuss transborder cooperation in doing enforcement of international laws pertaining to tapirs
   Time: 2004 – 2005
   Cost:
   Responsible: KPTT, CITES Management Authorities in each country

2. To create incentives and support for people ”on the ground” to enforce the law. Examples:
   a) Provide field equipment for field personnel responsible for enforcement and monitoring tapirs
      Time: 2004 – 2006
      Cost: 4 x $100,000
      Responsible: KPTT, NGOs, enforcement agencies
   b) Provide field per diems for patrol and enforcement staff to enable them to conduct their jobs effectively
      Time: 2004 – 2006
      Cost: 4 x $100,000
      Responsible: KPTT
   c) Motivational training for wildlife personnel in each range country to encourage them to participate in field work
      Time: 2004 – 2006
      Cost: 4 x $10,000
      Responsible: KPTT
   d) Recognition of the importance of field patrol staff in range countries by authorities (use of letters of recognition, promotion opportunities for field staff etc.)
      Time: 2004 – 2006
      Cost: 4 x $100,000
      Responsible: KPTT
   e) PA management training for PA managers in each range country that stresses the importance of law enforcement
      Time: 2004 – 2006
      Cost: 4 x $10,000
      Responsible: KPTT

Subgoal

3. Compile information on tapir status and develop a detailed map of tapir core areas in its entire range.

Actions

1. To conduct research on tapir ecology, surveys on tapir distribution and relate data to distribution of vegetation
   Time: 2004 – 2008
   Cost: $500,000

Responsible: TSG and partners e.g. PHKA, DWNP, DoNP, FD, Wildlife Conservation Society, WWF, other NGO's.

2. To define and identify tapir "core areas" based on results from 1 above
   Time: 2004 – 2008
   Cost:
   Responsible: TSG and partners e.g. PHKA, DWNP, DoNP, FD, Wildlife Conservation Society, WWF, other NGO's.
3. To conduct an overall registration of Tapir presence in close co-operation with NGOs and local people
   Time: 2005 – 2006
   Cost:
   Responsible: PHKA, DWNP, DoNP, FD and partners e.g. Wildlife Conservation Society, WWF, other NGO's.
4. To develop and distribute PR material regarding Action item 3 above
   Time: 2004 – 2005
   Cost: $200,000
   Responsible: KSTT, PHKA, DWNP, DoNP, FD and partners e.g. Wildlife Conservation Society, WWF, other NGO's.
5. To develop standard format for collection of tapir data
   Time: 2004
   Cost:
   Responsible: TSG and partners e.g. PHKA, DWNP, DoNP, FD, Wildlife Conservation Society, WWF, ARCBC, other NGO's.
6. To establish central databases in each range country and at TSG for tapir registration (re Action Item 3 above.)
   Time: 2005
   Cost: $200,000
   Responsible: KSTT and TSG and partners e.g. PHKA, DWNP, DoNP, FD, Wildlife Conservation Society, WWF, ARCBC, other NGO's.
7. Develop budgets and seek necessary funds for research (Action Item 1), survey (Action Item 3) and database (Action Item 6)
   Time: 2004 – 2005
   Cost:
   Responsible: TSG and partners e.g. PHKA, DWNP, DoNP, FD, Wildlife Conservation Society, WWF, ARCBC, other NGO's.

Subgoal

4. Increase of the coverage of Protected Areas in Myanmar, Sumatra and Malaysia.

Actions

1. To identify Tapir core areas in the three range countries that need further protection (based on Subgoal 3, Action Items 1 and 3)
   Time: 2007 – 2008
   Cost:
   Responsible: TSG and partners e.g. PHKA, DWNP, DoNP, FD, Wildlife Conservation Society, WWF other NGO's.

Subgoal

5. Incorporation of wildlife conservation concerns in landscape planning.

Actions

1. To conduct a workshop for relevant authorities to improve co-operation on conservation matters (could be included in Subgoal 1, Action Item 1)
   Time: 2005
   Cost: 4 x $10,000
   Responsible: TSG and partners e.g. PHKA, DWNP, DoNP, FD, Wildlife Conservation Society, WWF, other NGO's.
2. To develop Terms of Reference for landscape planning with inclusion of conservation considerations
   Time: 2005 – 2006
   Cost:
   Responsibility: TSG (Nat. Planning units of range states)
3. To make reference to Terms of Reference for all new developments obligatory
   Time: 2007
   Cost:
   Responsibility: KPTT, national planning units of range states

Remaining Subgoals

6. Transparency in forest management (*included in Subgoal 2*).
7. A better understanding of the market forces that drive illegal land use (*low priority*).

Notes:

KPTT: Kurnia for Sumatra, Petra for Malaysia, Tony for Thailand and Tony for Myanmar.
KSTT: Kurnia for Sumatra, Siti for Malaysia, Tony for Thailand and Tony for Myanmar.

Threat 2: Fragmentation/Edge Effects

Subdivision and exposure of habitat is due to roads, powerlines, other human infrastructure, and creation of Protected Areas with or without buffer zones. This effect is caused by improving transportation networks, rural development, increased access for logging, monuments and poor land-use planning.

Objective

To minimise fragmentation of existing tapir habitats and to reduce exposure of habitats to edge effects.

Subgoal

1. Establishment of buffer zones around existing Protected Areas and inclusion of buffer zones in the design of future Protected Areas.

Actions

1. To conduct a workshop for all four range countries to develop standards for the use of buffer zones around PAs
   Time: 2005
   Cost: $10,000
   Responsible: TSG (NGOs)
2. To conduct awareness campaign about the importance of buffer zones in all four range countries (directed towards the communities around PAs, PA managers and relevant authorities)
   Time: 2005
   Cost: $200,000
   Responsible: TSG
3. To establish a co-ordinating body for stakeholders with the purpose of disseminating information to stakeholders and to follow up on the result of Action Item 1 above
   Time: 2005
   Cost:
   Responsible: KPTT
4. To identify potential buffer zone areas around existing PAs (could be part of 2.1.1)
   Time: 2005
   Cost:
   Responsible: KPTT

5. To implement buffer zone standards in existing and future PA management plans
   Time: 2006
   Cost:
   Responsible: TSG

Subgoal

2. Incorporation of wildlife conservation concerns in landscape planning.

Actions

1. Actions here are the same as Objective 1, Subgoal 5, Actions 1 – 3

Subgoal

3. Reduction of negative effects of transportation networks and rural development.

Actions

1. To conduct workshops in range countries to develop standards for building of new roads in and around protected areas (inclusion of wildlife passages)
   Time: 2005
   Cost: 4 x $10,000
   Responsible: TSG, PHKA, DWNP, DoNP, FD, national planning agencies, national transportation agencies
2. Make restoration/re-planting of forest after closure of non-used roads in protected areas obligatory (could be included in the outcome of Action Item 1 above)
   Time: 2006

Cost:
Responsible: TSG, PHKA, DWNP, DoNP, FD, national planning agencies, national transportation agencies

3. Make it obligatory to include conservation concerns in the planning of roads and rural development in and around Protected Areas (including traffic restrictions and zoning)
   Time: 2006
   Cost:
   Responsible: KPTT, PHKA, DWNP, DoNP, FD, national planning agencies, national transportation agencies
4. To monitor wildlife activities after restoration of forest
   Time: 2007 – 2008
   Cost:
   Responsible: TSG, PHKA, DWNP, DoNP, FD, Wildlife Conservation Society, WWF and other NGO partners

Remaining Subgoals

4. Improved standards for building of new roads (wildlife passages).
5. Restrictions on traffic on logging roads (*included in Subgoal 3*).
6. Restoration/re-planting of non-used roads.

Notes:
KPTT: Kurnia for Sumatra, Petra for Malaysia, Tony for Thailand and Tony for Myanmar.

Threat 3: Fires (Only Regarding Sumatra)

Major fires due to shifting cultivation or vandalism and resulting from lack of fire control, lack of public awareness and lack of interest on the part of authorities of local people result in damage or destruction to habitat.

Objective

To minimise the negative effects of fires on Tapir habitats.

Subgoal

1. A change of attitude among locals and authorities towards avoiding the use of ”slash and burn” methods.

Actions

1. Actions here are the same as Objective 1, Subgoal 1, Actions 1 – 5
2. To develop and implement education programme and awareness campaign for sustainable agriculture
   Time: 2006
   Cost: $200,000
   Responsible: TSG
3. Organise a seminar for stakeholders about ”wise” use of land (could be based on Action item 2 above)

Time: 2005
Cost: $10,000
Responsible: Kurnia

Subgoal

2. Enforcement of existing legislation for Protected Areas.

Actions

1. Actions here are the same as Objective 1, Subgoal 2, Actions 1 – 2

Subgoal

3. To have qualified and sufficient firefighting equipment and personnel in all 6 provinces having tapirs (6 out of 9).

Actions

1. Conduct a workshop with the following tasks:
   a) To identify firefighting needs regarding equipment and expertise
   Time: 2004
   Cost: $10,000
   Responsible: Kurnia
   b) To develop standards for firefighting units (organisation, equipment etc.) to identify suitable places for setup of firefighting units
2. Allocate budget for training and implementation of firefighting units
   Time: 2005
   Cost:
   Responsible: Kurnia
3. To establish a firefighting task force co-ordinating firefighting in all nine provinces of Sumatra
   Time: 2006 – 2008
   Cost:
   Responsible: Kurnia
4. To conduct a survey on the sensitivity of Tapir habitats to fire
   Time: 2004
   Cost: $5,000
   Responsible: Kurnia
5. To include sensitivity to fire in landscape planning (zoning, buffer zones etc.)
   Time: 2005 – 2008
   Cost:
   Responsible: Kurnia

Subgoal

4. Improvement of co-operation between different authorities managing wildlife and forest.

Threat 4: Hunting (Including Capture)

Deliberate killing from sport hunting or pest control, or by live capture for pet trade, or incidental take from snaring, ignoring restrictions on licences. Caused by lack of awareness and lack of enforcement.

	MALAYSIA		MYANMAR		THAILAND		INDONESIA	
	DWNP	*Local*	*FD*	*Local*	*DNPWPC*	*Local*	*PHKA*	*Local*
Hunting	Nil	Low	Nil	Nil	Nil	Nil	Medium	Nil
Road-kills	Nil	Low	Nil	Nil	Nil	Nil	Nil	Nil
Incidental snares	Nil	Low	Low	Low	Nil	Low	High	Low
Sport hunting	Nil	Nil	Nil	Nil	Nil	Nil	Low	Nil
Trade to food industry, roadside zoos, collectors	Nil	Low	Nil	Nil	Nil	Low	High	Low
Pest animals	Nil	Low	Low	Low	Nil	Nil	Nil	Medium

DWNP Department of Wildlife and National Parks of Peninsular Malaysia
DNPWPC Department of National Parks, Wildlife and Plants Conservation
PHKA Perlindungan Hutan Dan Konservasi Alam
FD Forest Department

Objective
To minimise the number of tapirs killed (directly or indirectly) or captured by human activities

Subgoal
1. Enforcement of existing legislation on wildlife protection and revision of existing penalties.

Actions
1. Actions here are the same as Objective 1, Subgoal 2, Actions 1 – 2
2. To develop standards for registration of captures and kills of tapirs
   Time: 2004
   Cost:
   Responsible: TSG, PHKA, DWNP, DoNP, FD
3. To register all captures and kills of tapirs
   Time: 2004
   Cost:
   Responsible: KPTT
4. To work with authorities to revise penalties for illegal capture of wildlife and snare hunting
   Time: 2005
   Cost:
   Responsible: KPTT

5. To establish a central body for the four range countries to oversee the issue of export permits for wildlife
   Time: 2005
   Cost:
   Responsible: TSG, CITES Management Authorities in range states

Subgoal

2. A change of attitude among locals and authorities towards a total protection of tapirs.

Actions

1. Actions here are the same as Objective 1, Subgoal 1, Actions 1 – 5
2. To conduct awareness campaigns about protection of wildlife and existing hunting regulations in the four range countries
   Time: 2005
   Cost: $200,000
   Responsible: TSG

Notes:
KPTT: Kurnia for Sumatra, Petra for Malaysia, Tony for Thailand and Tony for Myanmar.

Threat 5: Mass tourism

Mass tourism leads to a disturbance of normal reproduction/behaviour, thereby leading to a reduction in available habitat. This is due to habitat trampling, development of park infrastructure and lack of park zoning, restrictions.

Objective

To minimise the negative effects of mass tourism on tapir habitats.

Subgoal

1. Implementation of action plans for all relevant Protected Areas.

Actions

1. To identify existing action plans for Protected Areas
   Time: 2004
   Cost:
   Responsible: KPTT
2. To encourage development and implementation of action plans for Protected Areas relevant for tapir conservation
   Time: 2004 – 2005
   Cost:
   Responsible: KPTT
3. To revise action plans for PAs every 5 years
   Time: Currently

Cost:
Responsible: KPTT

Subgoal

2. To cooperatively manage visitor activities and tapir habitat needs.

Actions

1. Conduct workshops in all four tapir range countries to define ”carrying capacity” for all Protected Areas relevant for tapir conservation with regard to number of visitors/visitor activities
   Time: 2008
   Cost: 4 x $10,000
   Responsible: TSG
2. To regulate number of tourist activities in Protected Areas according to carrying capacity, re Action Item 1 above
   Time: 2008
   Cost:
   Responsible: KPTT

Subgoal

3. To incorporate ecotourism into masterplans for all relevant Protected Areas.

Actions

1. To encourage relevant authorities to address ecotourism in all action plans for Protected Areas relevant to tapir conservation
   Time: 2005
   Cost:
   Responsible: KPTT
2. To encourage relevant authorities to use zoning in action plans for Protected Areas relevant to tapir conservation
   Time: 2005
   Cost:
   Responsible: KPTT

Notes:
KPTT: Kurnia for Sumatra, Petra for Malaysia, Tony for Thailand and Tony for Myanmar.

Three top priority action steps

1. To conduct awareness campaigns on the need for conservation of tapir habitats.
2. To create incentives and support for people on the ground to enforce the law.
3. To include conservation concerns in land use planning.

Problem:
During the workshop we identified a problem in the context of developing specific action items across the different working groups. The amounts for common activities in the four working groups must be co-ordinated in order to get common ground on this issue. Otherwise external readers of the final report will not understand the background for the "budget".

Appendix 1
Laws Of Malaysia-Protection Of Wild Life Act 1972 (Act 76) Reprint In 1994

- Schedule One Totally Protected Wild Animals (Page 58) [*Am. P.U. (A) 112/76, 249/84, 299/88, 306/91*.]
  3. Tapir (*Tapirus indicus*) Badak cipan, badak tampung.

- Part III Licences (Page 26) [*Am. Act A697*.]
  29. Subject to this Act no person shall-
    (a) shoot, kill or take any protected wild animal or protected wild bird, or take the nest or egg thereof;
    (b) carry on the business of a dealer;
    (c) carry on the business of a taxidermist;
    (d) house, confine or breed a protected wild animal or a protected wild bird other than as a dealer or taxidermist;
    (e) import into or export from West Malaysia any protected wild animal or protected wild bird or part of thereof;
    (f) keep the trophy of any protected wild animal or protected wild bird; or
    (g) enter a wild life sanctuary or a wild life reserve, unless he is the holder of a licence, permit or special permit (as the case may be) granted under this Act.
- Part III Licences (Page 27) [*Am. Act A697*.]
  31. Subject to this Act, the Minister may from time to time by order in the *Gazette* prescribe the conditions with respect to the granting of licences, permits and special permits and without prejudice to the generality of the foregoing may in particular prescribe-
    (a) the open or close season in respect of specified protected wild animals or protected wild birds;
    (b) the number of protected wild animals, protected wild birds, the nest or egg thereof or trophies which may be shot, killed, taken, housed, confined, bred or kept as may be authorized and specified in a license granted under section 30;
    (c) the methods or means by which specified wild animals or wild birds may be shot, killed or taken including the type of firearms;
    (d) the times during the day or night during which protected wild animals or protected wild birds or the nest or egg thereof may be shot, killed or taken;
    (e) the localities to which the shooting, killing or taking of specified protected wild animals or protected wild birds or the nest or egg thereof may be restricted;
    (f) the different categories of licenses, permits and special permits granted under this Act;
    (g) the quota of licenses and permits to be granted for-
      (i) each of the categories described in sections 29 and 30;
      (ii) each year or open season; and
      (iii) each State, in respect of each protected wild animal or protected wild bird or the nest or egg thereof;
    (h) the fees and forms of licences, permits and special permits; and
    (i) so that the standard of maturity of a protected wild animal which may be shot, killed, caught, bred, taken or confined or the standard of maturity of a protected

wild bird which may be caught, bred, taken or confined be specified in a licence, permit or special permit.

- Part III Licences (Page 28) [*Ins. Act A337*.]
  31A. Save as provided in PART V no licence or permit shall be granted to shoot, kill or take any protected wild animal or protected wild bird during a close season.

- Part III Licences (Page 29) [*Am. Act A697*.]
  33. No person shall be granted a licence to shoot a protected wild animal or a protected wild bird with a firearm unless-
    (a) he is the holder of a valid licence granted under the Arms Act 1960;
    (b) he produces that licence to the Director for Wild Life and national Parks when applyinng for a licence to shoot a protected wild animal or a protected wild bird; and
    (c) he satisfies the conditions prescribed by order with respect to the payment of deposits, fees and other condotions prescribed pursuant to section 31.

- Part III Licences (Page 29) [*Am. Act A697*.]
  34. Save as provided in Part V no licence or permit shall be granted in respect of-
    (a) any totally protected wild animal or part thereof or totally protected wild bird or part thereof;
    (b) any immature totally protected wild animal or part thereof or immature totally protected wild bird or part thereof; and
    (c) the nest or egg of ny totally protected wild animal or totally protected wild bird.

- Part III Licences (Page 38) [*Am. Act A337; A697*.]
  53. Any officer acting bona fide in the exercise of his powers may shoot, kill or take any wild animal or wild bird if-
    (a) the wild animal or wild bird is a danger to human life or property;
    (b) it is necessary or expedient to prevent undue suffering on the part of the wild animal or wild bird; or
    (c) he is accompanying the holder of a special permit issued under section 51.

- Part III Licences (Page 38) [*Am. Act A337; A697*.]
  55. (1) Notwithstanding anything in any other section and save as provided in this section where a wild animal or a wild bird is causing or there is reason to believe that it is about to cause serious damage to crops, vegetables, fruit, growing timber, domestic fowls or domestic animals in the possession of an owner or occupier of land, the owner or occupier or his servants or any person appointed under section 4(1) may shoot, kill or take the wild animal or wild bird if-
    (a) he first uses reasonable efforts to frighten away the wild animal or the wild bird (including the firing into the air of a firearm); and
    (b) these reasonable efforts fail to frighten away the wild animal or the wild bird.
  (2) An owner occupier of land pursuant to this section shall report the details of the damage (if any) and the species of the wild animal or the wild bird to any officer notwithstanding that no wild animal or wild bird is shot, killed or taken, and where

the owner or occupier has shot, killed or taken the wild animal or the wild bird he shall, unless he is licensed to do so, make the same report.
(3) Where a wild animal or a wild bird has caused serious damage pursuance to subsection (1) but has ceased to do so it shall not be shot, killed or taken.
(4) Any wild animal or wild bird shot, killed or taken in pursuance of this section shall be the property of the State and shall without delay be handed to any person appointed under section 4(1).

- Part III Licences (Page 39) [*Am. Act A697*.]
  56. (1) Notwithstanding anything in any section other than this section and section 94, if a wild animal constitutes an immediate danger to human life any personn may shoot, kill or take the wild animal but where the person availing himself of this exception provokes or wounds the wild animal which consequently becomes an immediate danger to human life, the person shall be absolved from guilt only in respect of the first mentioned act and may be found guilty in respect of the second mentioned act pursuant to section 94.
  (2) For the purposes of this section an 'immediate danger to human life' arises when there is reason to believe that the wild animal is not shot, killed or taken it may cause loss of human life.
  (3) Where pursuant to this section any person shoots, kills or takes any wild animal with the object of saving human life he shall (unless he is licenced to shoot, kill or take the wild animal) forthwith report the matter to any officer and where the person wounds the wild animal the provisions of section 102 shall apply.
  (4) Any wild animal shot, killed or taken in pursuance of this section shall be the property of the State and shall without delay be handed to an officer.

- Part VI Offences And Penalties Chapter One General Protection (Page 43) [*Am. Act A337; A697*.]
  64. (1) Every person who unlawfully shoots, kills or takes a totally protected wild animal or a totally wild bird (other than an immature totally protected wild animal or an immature totally wild bird or the female of a totally protected wild animal or of a totally protected wild bird) is guilty of an offence and shall on conviction be liable to a fine not exceeding $5,000.00 or to a team of imprisonment not exceeding 3 years or to both.
  (2) Every person (other than the person described in sections 64 (1), 65, 66 and 67) who is in possession of or who carries on the business of a dealer or a taxidermist in respect of-
  (a) a totally protected wild animal or a totally protected wild bird or a trophy thereof;
  (b) the nest or the egg of a totally protected wild animal or a totally protected wild bird,
  is guilty of an offence and shall on conviction be liable to a fine not exceeding $3,000.00 or to a term of imprisonment not exceeding 2 years or to both.

- Part VI Offences And Penalties Chapter One General Protection (Page 44) [*Am. Act A697*.]

65. Every person who unlawfully shoots, kills or takes an immature totally protected wild animal or an immature totally protected wild bird is guilty of an offence and shall on conviction be liable to a fine not exceeding $6,000.00 or to a term of imprisonment not exceeding 6 years or to both.

- Part VI Offences And Penalties Chapter One General Protection (Page 44) [*Am. Act A697*.]

66. Every person who unlawfully shoots, kills or takes the female of a totally protected wild animal or of a totally protected wild bird is guilty of an offence and shall on conviction be liable to a fine not exceeding $10,000.00 or to a term of imprisonment not exceeding 10 years or to both.

- Part VI Offences And Penalties Chapter One General Protection (Page 44) [*Am. Act A697*.]

67. Every person who unlawfully takes or damages or destroys the nest or egg of a totally protected wild animal or a totally protected wild bird is guilty of an offence and shall on conviction be liable to a fine not exceeding $5,000.00 or to a term of imprisonment not exceeding 5 years or to both.

- Part VI Offences And Penalties Chapter One General Protection (Page 46) [*Am. Act A697*.]

74. (1) Every person who shoots, kills or takes a totally protected wild animal or a totally protected wild bird between 7.30 pm and 6.30 am is guilty of an offence and shall on conviction be liable (in addition to any other penalty provided for any other offence) to a fine not exceeding $3,000.00 or to a term of imprisonment not exceeding 2 years or to both.

(2) Every person (whether he is a licenced hunter or ortherwise) who shoots, kills or takes a protected wild animal or a protected wild bird other than during the hours permitted and prescribed by the Minister in respect of the specified protected wild animal or protected wild bird pursuant to an order made under section 31 (d), is guilty of an offence and shall on conviction be liable (in addition to any other penalty provided for any other offence) to a fine not exceeding $2,000.00 or to a term of imprisonment not exceeding 1 year or to both.

(3) (*Repealed by Act A697*).

- Part VI Offences And Penalties Chapter Two Methods of shooting, killing, taking, etc (Page 47) [*Am. Act A337, A697*.]

76 (1) Every person who sets, places or uses any jerat or explosive for the purpose of shooting, killing or taking any wild animal or wild bird is guilty of an offence and shall on conviction be liable to a fine not exceeding $5,000.00 or to a term of imprisonment not exceeding 5 years or to both.

(2) Every person (unless in possession of a written authority from the Director General for Wild Life and National Parks) who is in possession of a jerat is guilty of an offence and shall on conviction be liable to the same penalty prescribed under subsection (1).

- Part VI Offences And Penalties Chapter Two Methods of shooting, killing, taking, etc (Page 47) [*Am. Act A697*.]
  76A. (1) Every person who has in his unlawful possession 25 or more jerat is guilty of an offence and shall on conviction be liable to a term of imprisonment not exceeding 10 years.
  (2) In subsection (1) 'jerat' means a wire snare.

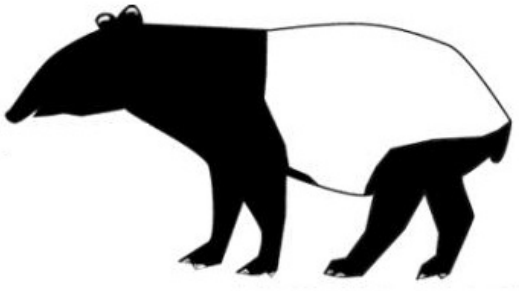
The relevant Thailand law is the Wild Animals Reservation and Protection Act 1992. Under this law Malay tapirs are a reserved animal, the highest level of protection afforded a wild animal.

Under Myanmar law, the Malay tapir is also a Completely Protected species.

Malay Tapir Conservation Workshop

12 – 16 August 2003

National Biology Conservation Training Center
Krau Wildlife Reserve, Malaysia



Section 5
Species Management Working Group

Species Management Working Group Report

Working Group participants:

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Suwat Kaewsirisuk	Hala-Bala Wildlife Sanctuary, Department of National Parks, Wildlife and Plant Conservation, Thailand

Problem Statements

The working group came up with the following general statements pertaining to the basic issue of Malay tapir management in the region.

- Lack of tapir research and researcher(s) at the university level
- Lack of interest among academicians concerning tapir biology and conservation
- Priority with small mammals
- Students are not interested in studying tapirs
- Permits from the minister are difficult to obtain
- Relatively easy employment in bio-tech fields
- Study of science is not emphasized in Malaysia
- The Government provides grant support for bio-tech studies; hence, funds for basic biological studies are reduced
- There is little to no emphasis on taxonomic studies in the region
- There is no basic information or knowledge on tapir
- There is a general lack of data on wild tapir populations
- No specific officer exists in the region for tapir research
- There is manipulation of quality of data
- No specific centre of research for wildlife exists in the region
- There is no legal requirement for fauna inventory in relation to commercial extraction of timber

- There is a lack of coordination between government agencies in terms of utilization of available data; for example, the Forestry Department in Malaysia does not take into consideration the inventory of wildlife developed by the Wildlife Department (this situation is peculiar to Malaysia)
- There is a lack of popular publication to raise awareness among the public
- DWNP field staff views tapir as a "common" species during census and therefore the species is not considered critical to warrant conservation.
- The absence of real conflict between tapirs and people does not warrant the attention that it might need compared to highly conflicted situations with tigers and elephants
- General infrastructure development will take priority over conservation – logging, road construction and pressure from land conversion like agriculture and encroachment of human settlement.
- There is no awareness program for environmental conservation – no long term grassroots program
- The lack of captive breeding in zoos of which zoo can play its role as ex-situ conservation entity
- An erosion of tapir needs from the public mind of Thailand due to crowding from high profile species although the animal is on the brink of 'extinction' due to habitat fragmentation
- There is a lack of coordination among range countries in terms of enforcement of environmental laws
- There is a lack of knowledge on how to manage tapirs in protected areas
- Habitat destruction and fragmentation: population growth leading to creation of development centers - government policies to link-up development centres with roads and highways, creation of dams to meet energy and water demands, pressure from agriculture development, forest fires

These 26 problem statements were collapsed down to three primary areas of concern, listed here in priority of importance:

<u>Policy</u>
Owing to growing population and the strive for economic development, Malay Tapir range states prioritize development over landscape conservation.

<u>Research</u>
Due to inadequate incentives and emphasis, there is a lack of basic research on tapir, both in captivity and in the wild, leading to poor understanding of the conservation importance and management of the species.

<u>Awareness</u>
Insufficient knowledge and information dissemination on tapir is causing a lack of awareness and support for conservation of the species.

Conservation Policy: Data Assembly and Analysis

Facts

- National Physical Plan (MY)- 2020
- National Development Program (TH and MY) on 5-year basis
- National BioD Policy 1998 (MY)
- Strategic Planning for BioD Conserv. (IN)
- National Forestry Policy (MY)
- National Forestry Plan (TH)
- National Forestry Guideline (IN)
- National Water Resource Study (MY)
- National Ecotourism Plan (MY)
- Environmental Impact Assessment (MY, TH, IN)
- Sustainable Development of the Highlands (MY)
- National Conservation Strategy (MY)
- DWNP-DANCED Management Plan for Protected Areas (MY)

(MY, Malaysia; IN, Indonesia; TH, Thailand)

Ranking scheme for major policies

	Emphasis	Malaysia	Thailand	Indonesia	Points
Nat. BioD. Policy	conservation	yes	no	yes	24
Spatial/Landscape Planning	development	yes	yes	yes	24
Nat. Forestry Policy	forestry	yes	yes	yes	22
Protected Area Mgt.	PA	yes	yes	yes	28

Assumptions

- These policies will translate to conservation action on the ground.
- These policies will lead to financial resources being made available for research and conservation programs.
- These policies are directly related to tapir conservation.

Missing Information

- No system to evaluate effectiveness or applicability to tapir conservation.
- Policy documents or knowledge for other range state are not available (apart from MY, TH, and IN).

Tapir Research: Data Assembly and Analysis

Facts

- IRPA grants (MOSTE) limited to research institutes and universities
- Only 4 groups doing research on tapirs (i.e., Andalas Univ. , BioD Foundation, Inst. for Indonesian National Science, etc.)

- Tapir research currently ongoing in Krau (Copenhagen Zoo- DWNP-USM)
- DWNP – captive observations, wildlife inventories, MIS
- Royal Forestry Thailand – species checklist
- DWNP RPU also collect data on tapir presence
- Large mammal population biologists lacking (especially for tapirs) and also information on who is who in tapir conservation.
- DWNP, Dept. Kehutanan, Royal Forestry Dept. – all don't have specific tapir programs

Prioritization for Tapir Research

Grants	20	
Expertise	15	Most important
Programs	24	
Inventory	38	Least important

Assumptions

- Availability of financial resources will translate to good tapir research programs.
- If money is available for tapir research the assumption is that specific positions will be created to manage the program.
- There will be enough local interest to develop tapir conservation program.
- Information on tapir ecology from Neotropics applies to the Malay tapir.

Missing Information

- Knowledge and information on research in other range states (apart from MY, TH, and IN).
- Baseline data on tapir distribution and densities in SE Asia lacking or incomplete.

Public Awareness: Data Assembly and Analysis

Facts

- There is no central hub for information management and dissemination.
- ACAP (Asian Conservation Awareness Programme) – OK but not targeted at tapir
- MAZPA (Malaysian Zoological Park and Aquaria) – lacks a consolidated large mammal awareness program.
- SEAZA (SE Asian Zoological Association) – no program for tapirs
- MNS (Malaysian Nature Society) – has tapir awareness program
- TSI (Taman Safari Indonesia) – has awareness program on tapirs
- National Government level

Prioritization of responsibility for public awareness

Nat. Gov.	13	Most important
NGOs	18	
Private Enter.	35	
Local Zoo Assoc.	39	
Asean level	44	
SEAZA	56	Least important

Assumptions

- A full complement of awareness programs has direct conservation impact on the ground.
- Awareness programs will raise the conservation profile of tapirs amongst the general public.
- A full complement of research programs has direct conservation impact on the ground.
- There will be enough local interest to develop tapir conservation programs.

Missing Information

- Our knowledge base of hunter and local community understanding and perception of tapir conservation.

Working Group Goals and Actions

Policy

Owing to a growing population and nations striving for economic development, Malay Tapir range countries prioritize development policies over landscape conservation.

Primary Goal

A model country approach that favors landscape sustainable development and large mammal (e.g. tapir) conservation defined

Supporting Goals

- To get a clear picture on policy-related documents throughout Malay Tapir range countries and assess their effectiveness or applicability to conservation of the species.

  Action

  Develop an inventory of policy related to wildlife management

  Responsibility: MOSTE (Conservation Division); Andalas University, Indonesia (Dept. of Biology); Lampung University;Kerinci Seblat National Park, Indonesia; BKSDA; Royal Forestry Department (Thailand); Vietnam; WCS-Cambodia
  Timeline: 2003 – 2005
  Outcome: Report form
  Partners: EPU; International Rhino Foundation; WWF Indonesia; TNKS (Indonesia); all Universities in Thailand
  Resources: US$50,000; expertise in law; internal institution budgets
  Consequences: Clear picture on policy and analysis for action available
  Obstacles: Politicians; government bureaucracy

- To have realistic policies with regard to the needs of local people living in and around tapir habitats and tapir conservation

  Action

  Revise and rewrite appropriate policies and propose the resulting modified policies to the Parliament

  Responsibility: PAs under MOSTE (Conservation Division); Forestry Departments of Malaysia, Thailand and Indonesia; Head of Malaysia PA's division (DWNP)
  Timeline: 2004 – 2006
  Outcome: Report on new policies for tapir conservation
  Partners: Local people; Non-governmental organizations; local governments
  Resources: US$10,000; expertise in, e.g., anthropology
  Consequences: New policies that meet the need of local people
  Obstacles: Politicians; government bureaucracy

- To conduct a cost-benefit analysis of development projects resulting from strategic development policies versus conservation programs resulting from biodiversity strategic planning policies.

  Action

  Conduct a detailed cost – benefit analysis of economic development vs. conservation policies

  Responsibility: EPU; BAPPEDA; EPU (Thailand); BAPEDALDA
  Timeline: 2004 – 2008
  Outcome: Analysis of cost and benefits of economic and conservation policy
  Partners: Non-governmental organizations; local governments
  Resources: Expertise in resource economics and planning; Land offices; local governments
  Consequences: Sustainable development becomes possible relevant to tapir conservation
  Obstacles: Lack of expertise; funds

- To study and analyze key objectives in national policies to better understand overlapping aims and identify opportunities for synergy in relation to responsibilities, implementation, jurisdiction and strategies follow up actions.

  Action

  Conduct national – level studies on resource management and land-use sectoral development and biological diversity policies in view of identifying sectors that support tapir habitat conservation.

  Responsibility: MOSTE (Conservation Division); local people; hunters and other stakeholders
  Timeline: 2004 – 2006
  Outcome: Report of results of study
  Partners: Universities; Non-governmental organizations; local governments
  Resources: US$20,000; local expertise
  Consequences: More opportunities for synergy in conservation action; more funding / more donors

Obstacles: Lack of information and cooperation; government bureaucracy

- To determine a mechanism by which large mammal habitat conservation across political boundaries at the Southeast Asian level can feature prominently at ASEAN-level (Association of Southeast Asian Nations) discussions.

  Action

  Organize and conduct an ASEAN meeting focusing on large mammal conservation in the region.

  Responsibility: Esp. Secr. Of ASEAN; DWNP (Head of Research Division), Malaysia; Zoos of the region; Andalas University, Indonesia; Universiti Lampung; Forestry Dept.; SEAZA; ARCBC
  Timeline: August 2004
  Outcome: Meeting proceedings; policies for cross-boundary conservation
  Partners: IUCN; Tapir Specialist Group; Conservation Breeding Specialist Group
  Resources: Steering committee
  Consequences: More regional cooperation in large mammal conservation
  Obstacles: Lack of information and cooperation; government bureaucracy

Research

Due to inadequate incentives and emphasis, there is a lack of basic research on tapir, both in captivity and in the wild, leading to poor understanding of the conservation importance and management of the species.

Primary Goal

More individuals and institutions involved in basic research on the Malay Tapir.

Supporting Goals

- Sufficient funds available for research on Malay Tapir.

  Action

  Develop funds for tapir research in the region.

  Responsibility: DWNP (Head of Research Division); University (Dept. of Zoology, UM, UKM); Royal Forestry Department
  Timeline: January 2004 and onwards
  Outcome: Funds available for tapir research
  Partners: IUCN; Tapir Specialist Group
  Resources: US$25,000; addresses of appropriate foundations
  Consequences: Tapir conservation will be possible
  Obstacles: Potential donors are not interested in tapir conservation

- Sufficient capacity for *in-situ* and *ex-situ* conservation of Malay Tapir.

  Action

  Initiate training programs for *in-situ* and *ex-situ* tapir conservation: population studies, reproduction, and behavior

  Responsibility: Zoo Negara; SEAZA; DWNP (Head of training div.); RFD; MAPZA, RFD
  Timeline: 2004 – 2005

Outcome: Increased skill and knowledge in tapir research methodologies and technologies
Partners: IUCN; Tapir Specialist Group, SEAZA
Resources: US$5,000 per training program; knowledgeable personnel and experience
Consequences: Research is possible; greater level of employment for local conservation biologists
Obstacles:

- Conservation and management network established among the tapir range countries.
  Action
  Establish a Global Tapir Forum
  Responsibility: Zoo Negara; SEAZA; DWNP (Head of training div.); RFD; MAPZA, RFD
  Timeline: 2004
  Outcome: Effective collaboration among range countries
  Partners: IUCN; Tapir Specialist Group; SEAZA; Thai Zoo Association
  Resources: Affiliation fee
  Consequences: Better networking; achievement of globalization
  Obstacles: Limited funds; government bureaucracy

- Wildlife Research Institute established in tapir range countries.
  Action
  Establish a Wildlife Research Institute
  Responsibility: EPU; MOSTE (Conservation Institute); PHPA
  Timeline: 2004 – 2010
  Outcome: An established Institute in each country (except Thailand)
  Partners: TSG, DWNP, TNKS
  Resources: US$2,000,000
  Consequences: Better collaboration; emergence of local researchers; more frequent publication in peer-reviewed scientific journals.
  Obstacles: Limited funds

Awareness

Insufficient knowledge and information dissemination on the Malay Tapir is causing a lack of awareness of and support to conservation of the species.

Primary Goal

The general public and local communities living in and around tapir habitats are fully aware, support and participate in tapir conservation efforts.

Supporting goals

- NGO involvement in tapir conservation and awareness increased
  Action
  Organize and conduct a meeting of NGOs on regional tapir conservation

Responsibility: WWF (Head of Conservation Division); MNS; Mitra Rhino; Regional zoos, WCS; RFD; MOSTE (Conservation Division)
Timeline: 2004 – 2005 (workshop June 2005)
Outcome: Meeting Proceedings distributed at the regional level
Partners: Universities; governments; zoos; research institutions; TSG; IUCN
Resources: US$100,000
Consequences: More effective involvement of NGOs in regional tapir conservation
Obstacles: Limited funds

- The knowledge of the stakeholders such as local people, hunters as well as the scientific community shared and used for awareness-raising.

  Action

  Develop an awareness campaign among local stakeholder communities (hunters, local villagers, etc.)

  Responsibility: MOSTE (Conservation Division, Education Department); NGOs; Univ.(Anthropology div. UKM, UM); Zoo Negara; SEAZA; MAZPA
  Timeline: June 2005 – December 2008
  Outcome: Increased awareness of tapir conservation issues among local people and hunters
  Partners: WWF; TSG; IUCN
  Resources: US$100,000
  Consequences: More effective local support for tapir conservation
  Obstacles: Difficulty in organizing local people and hunters

  Action

  Develop a Rural Participatory workshop

  Responsibility: MOSTE (Conservation Division); social NGOs; local community; Ahli Dewan Negeri; Per. OA
  Timeline: January 2005 – December 2008
  Outcome: Local grassroots knowledge now available
  Partners: Environmental NGOs
  Resources: US$100,000
  Consequences: Greater buy-in and involvement in tapir conservation among local communities
  Obstacles: Difficulty in obtaining information from local people

- Alternative livelihoods and economic activities for local communities identified particularly where lifestyle changes are required in support to Malay Tapir conservation.

  Action

  Create opportunities for tourism-related jobs such as nature guides, rangers, boatmen, etc.

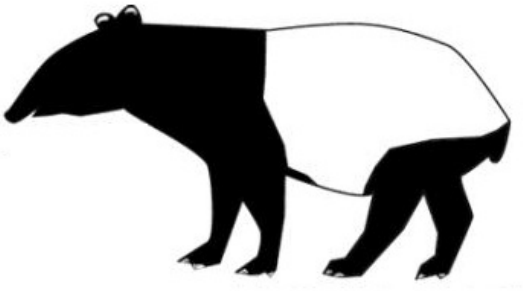
  Responsibility: Government institutions; MOCAT; TNKS
  Timeline: 2003 – 2008
  Outcome: Lifestyle changes through increased income
  Partners: Environmental and social NGOs; JOA; hotel industry associations; traditional leaders
  Resources: US$1,000,000

Consequences: Increase in amount of tapir habitat maintained
Obstacles: Social NGOs and selected national policies may not support this development.

Malay Tapir Conservation Workshop

12 – 16 August 2003

National Biology Conservation Training Center
Krau Wildlife Reserve, Malaysia



Section 6
Workshop Participants

MALAY TAPIR CONSERVATION WORKSHOP
KRAU WILDLIFE RESERVE, MALAYSIA, 12-16 AUGUST 2003

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Malay Tapir Conservation Workshop

12 – 16 August 2003

National Biology Conservation Training Center
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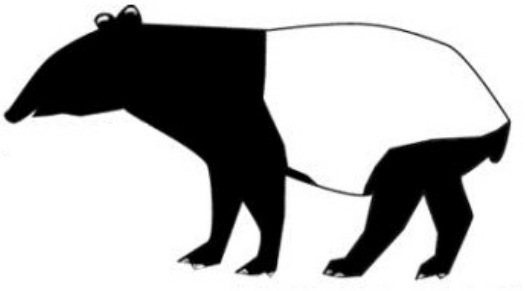

Section 7
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Literature Cited

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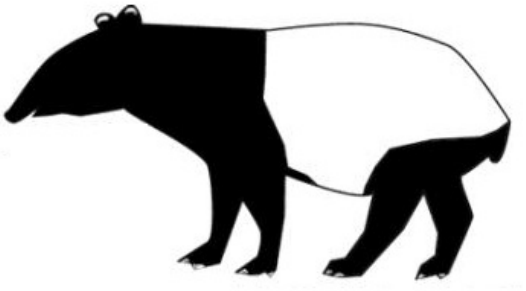

Section 8
Acronym Glossary

Acronym Glossary

ACAP	Asian Conservation Awareness Programme
ARCBC	ASEAN Regional Centre for Biodiversity Conservation
ASEAN	Association of South East Asian Nations
ASEAN PA	Association of South East Asian Nations Protected Areas
AMC	ASEAN Member Countries
BAPPEDA	Directory of Development Planning Board
BAPEDALDA	Badan Pengendalian Dampak Lingkungan Daerah
BBS	Bukit Barisan Selatan National Park, Indonesia
BKSDA	Balai Konservasi Sumber Daya Alam Jawa Barat Indonesia
CBSG	Conservation Breeding Specialist Group
CITES	Convention on International Trade of Endangered Species
DoNP	Department of National Parks, Indonesia
DNPWPC	Department of National Parks, Wildlife and Plants Conservation, Thailand
DWNP	Department of Wildlife and National Parks, Malaysia
DWNP-DANCED	Danish Cooperation for Environment and Development
DWNP RPU	Department of Wildlife and National Parks Rhino Protection Unit
EPU	Economic Planning Unit
FAO	Food and Agriculture Organization of the United Nations
GIS	Geographic Information System
GO	Governmental Organization
GPS	Geographic Positioning System
IRPA	International Radiation Protection Association
IUCN	World Conservation Union
JHEOA	Jabatan Hal Ehwal Orang Asli
MAZPA	Malaysian Zoological Park and Aquaria
MNS	Malaysian Nature Society
MOCAT	Ministry of Culture, Arts and Tourism, Malaysia
MOF Indonesia	Ministry of Forestry, Indonesia
MOSTE Malaysia	Ministry of Science, Technology and the Environment Malaysia
MOU	Memorandum of Understanding
MTC	Malaysian Timber Council
NGO	Non-governmental Organization
PA	Protected Area
PHKA	Perlindungan Hutan Dan Konservasi Alam, Indonesia
PHVA	Population and Habitat Viability Assessment
PVA	Population Viability Assessment
PR	Public Relations
SEAZA	South East Asian Zoos Association
SSC	Species Survival Commission
TNKS	Taman Nasional Kerinci Seblat, Indonesia
TSG	Tapir Specialist Group
TSI	Taman Safari Indonesia
WCS	Wildlife Conservation Society
WWF	World Wildlife Fund
WWF-M	World Wildlife Fund, Malaysia

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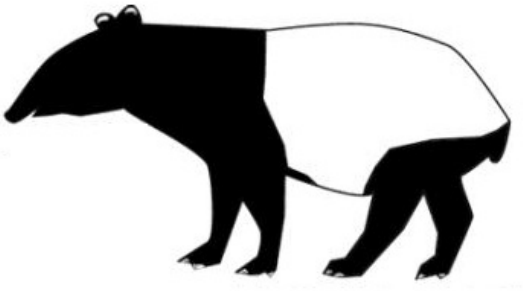

Section 9
IUCN Policy Statements

IUCN Technical Guidelines On The Management Of *Ex Situ* Populations For Conservation

Approved at the 14th Meeting of the Program Committee of Council, Gland Switzerland, 10 December 2002

PREAMBLE

IUCN affirms that a goal of conservation is the maintenance of existing genetic diversity and viable populations of all taxa in the wild in order to maintain biological interactions, ecological processes and function. Conservation managers and decision-makers should adopt a realistic and integrated approach to conservation implementation. The threats to biodiversity in situ continue to expand, and taxa have to survive in increasingly human-modified environments. Threats, which include habitat loss, climate change, unsustainable use, and invasive and pathogenic organisms, can be difficult to control. The reality of the current situation is that it will not be possible to ensure the survival of an increasing number of threatened taxa without effectively using a diverse range of complementary conservation approaches and techniques including, for some taxa, increasing the role and practical use of ex situ techniques.

If the decision to bring a taxon under ex situ management is left until extinction is imminent, it is frequently too late to effectively implement, thus risking permanent loss of the taxon. Moreover, ex situ conservation should be considered as a tool to ensure the survival of the wild population. Ex situ management should be considered only as an alternative to the imperative of in situ management in exceptional circumstances, and effective integration between in situ and ex situ approaches should be sought wherever possible.

The decision to implement an ex situ conservation program as part of a formalized conservation management or recovery plan and the specific design of and prescription for such an ex situ program will depend on the taxon's circumstances and conservation needs. A taxon-specific conservation plan may involve a range of ex situ objectives, including short-, medium- and long-term maintenance of ex situ stocks. This can utilize a variety of techniques including reproduction propagation, germplasm banking, applied research, reinforcement of existing populations and re-introduction into the wild or controlled environments. The objectives and overall purpose should be clearly stated and agreed among organizations participating in the program, and other relevant stakeholders including landowners and users of the taxon involved. In order to maximize their full potential in conservation, ex situ facilities and their co-operative networks should adopt the guidelines defined by the Convention on Biological Diversity (CBD), the International Agenda for Botanic Gardens in Conservation, Center for Plant Conservation and the World Zoo Conservation Strategy, along with other guidelines, strategies, and relevant legislative requirements at national and regional levels. IUCN recognizes the considerable set of resources committed worldwide to ex situ conservation by the world's zoological and botanical gardens, gene banks and other ex situ facilities. The effective utilization of these resources represents an essential component of conservation strategies at all levels.

VISION

To maintain present biodiversity levels through all available and effective means including, where appropriate, ex situ propagation, translocation and other ex situ methodologies.

GOAL

Those responsible for managing ex situ plant and animal populations and facilities will use all resources and means at their disposal to maximize the conservation and utilitarian values of these populations, including: 1) increasing public and political awareness and understanding of important conservation issues and the significance of extinction; 2) co-ordinated genetic and demographic population management of threatened taxa; 3) re-introduction and support to wild populations; 4) habitat restoration and management; 5) long-term gene and biomaterial banking; 6) institutional strengthening and professional capacity building; 7) appropriate benefit sharing; 8) research on biological and ecological questions relevant to in situ conservation; and 9) fundraising to support all of the above. *Ex situ* agencies and institutions must follow national and international obligations with regard to access and benefit sharing (as outlined in the CBD) and other legally binding instruments such as CITES, to ensure full collaboration with all range States. Priority should be given to the ex situ management of threatened taxa (according to the latest IUCN Red List Categories) and threatened populations of economic or social/cultural importance. Ex situ programs are often best situated close to or within the ecogeographic range of the target taxa and where possible within the range State. Nevertheless a role for international and extra regional support for ex situ conservation is also recognized. The option of locating the ex situ program outside the taxa's natural range should be considered if the taxa is threatened by natural catastrophes, political and social disruptions, or if further germplasm banking, propagation, research, isolation or reintroduction facilities are required and cannot be feasibly established. In all cases, ex situ populations should be managed in ways that minimize the loss of capacity for expression of natural behaviors and loss of ability to later again thrive in natural habitats.

TECHNICAL GUIDELINES

The basis for responsible ex situ population management in support of conservation is founded on benefits for both threatened taxa and associated habitats.

- The primary objective of maintaining ex situ populations is to help support the conservation of a threatened taxon, its genetic diversity, and its habitat. Ex situ programs should give added value to other complementary programs for conservation.

  Although there will be taxa-specific exceptions due to unique life histories, the decision to initiate ex situ programs should be based on one or more of the appropriate IUCN Red List Criteria, including:

  1. When the taxa/population is prone to effects of human activities or stochastic events or

  2. When the taxa/population is likely to become Critically Endangered, Extinct in the Wild, or Extinct in a very short time. Additional criteria may need to be considered in some cases where taxa or populations of cultural importance, and significant economic or scientific importance, are threatened. All Critically Endangered and Extinct in the Wild taxa should be subject to ex situ management to ensure recovery of wild populations.

- Ex situ conservation should be initiated only when an understanding of the target taxon's biology and ex situ management and storage needs are at a level where there is a reasonable probability that successful enhancement of species conservation can be achieved; or where the development of such protocols could be achieved within the time frame of the taxon's required conservation management, ideally before the taxa becomes threatened in the wild. Ex situ institutions are strongly urged to develop ex situ protocols prior to any forthcoming ex situ management.

Consideration must be given to institutional viability before embarking on a long term ex situ project.

- For those threatened taxa for which husbandry and/or cultivation protocols do not exist, surrogates of closely related taxa can serve important functions, for example in research and the development of protocols, conservation biology research, staff training, public education and fundraising.
- While some ex situ populations may have been established prior to the ratification of the CBD, all ex situ and in situ populations should be managed in an integrated, multidisciplinary manner, and where possible, in accordance with the principles and provisions of the CBD.
- Extreme and desperate situations, where taxa/populations are in imminent risk of extinction, must be dealt with on an emergency basis. This action must be implemented with the full consent and support of the range State.
- All ex situ populations must be managed so as to reduce risk of loss through natural catastrophe, disease or political upheaval. Safeguards include effective quarantine procedures, disease and pathogen monitoring, and duplication of stored germplasm samples in different locations and provision of emergency power supplies to support collection needs (e.g. climate control for long term germplasm repositories).
- All ex situ populations should be managed so as to reduce the risk of invasive escape from propagation, display and research facilities. Taxa should be assessed as to their invasive potential and appropriate controls taken to avoid escape and subsequent naturalization.
- The management of ex situ populations must minimize any deleterious effects of ex situ management, such as loss of genetic diversity, artificial selection, pathogen transfer and hybridization, in the interest of maintaining the genetic integrity and viability of such material. Particular attention should be paid to initial sampling techniques, which should be designed to capture as much wild genetic variability as practicable. Ex situ practitioners should adhere to, and further develop, any taxon- or region-specific record keeping and genetic management guidelines produced by ex situ management agencies.
- Those responsible for managing ex situ populations and facilities should seek both to increase public awareness, concern and support for biodiversity, and to support the implementation of conservation management, through education, fundraising and professional capacity building programs, and by supporting direct action in situ.
- Where appropriate, data and the results of research derived from ex situ collections and ex situ methodologies should be made freely available to ongoing in-country management programs concerned with supporting conservation of in situ populations, their habitats, and the ecosystems and landscapes in which they occur .

NB. Ex situ conservation is defined here, as in the CBD, as "the conservation of components of biological diversity outside their natural habitats". Ex situ collections include whole plant or animal collections, zoological parks and botanic gardens, wildlife research facilities, and germplasm collections of wild and domesticated taxa (zygotes, gametes and somatic tissue).

IUCN Guidelines for the Placement of Confiscated Animals

Approved by the 51st Meeting of the IUCN Council, Gland, Switzerland February 2000

EXECUTIVE SUMMARY

Live wild animals are confiscated by local, regional, and national authorities for a variety of reasons. Once they have taken possession of these animals, these authorities must dispose of them responsibly, in a timely and efficient manner. Prevailing legislation, cultural practices, and economic conditions will influence decisions on appropriate disposition of confiscated animals. Within a conservation context, there are several possible options fromwhich to choose:

1) to maintain the animals in captivity for the remainder of their natural lives;
2) to return the animals to the wild;
3) to euthanize the animals, i.e., humanely destroy them

The IUCN Guidelines for the Placement of Confiscated Animals discuss the benefits and risks involved in each of these options. These Guidelines should be read in conjunction with the IUCN Guidelines for Re-introductions (IUCN 1998). They should also be read with reference to the CITES Guidelines for the Disposal of Confiscated Live Species of Species Included in the Appendices (Resolution Conf. 10.7) and the IUCN Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species.

Returning confiscated animals to the wild is often considered the most popular option for a confiscating agency and can garner strong public support. However, such action poses real risks and problems and generally confers few benefits. These risks and problems include, but are not limited to, the following.

1. The mortality of animals released from captivity is usually high. Confiscated mammals and birds captured as juveniles have not learned the skills they need to survive in the wild. Other animals may be weakened or otherwise affected by their time in captivity and, thus, less able to survive. Finally, there is little chance of survival if the animals are released at a site that is not appropriate for the ecology or behavior of the species.
2. Animals released into the wild outside of their natural range – if they survive at all – have the potential to become pests or invasive. The effects of invasive alien species are a major cause of biodiversity loss, as such species compete with native species and in other ways compromise the ecological integrity of the habitats in which they have become established.
3. Having been in trade or a holding facility often in association with other wild animals and, in some instances, domesticated ones, confiscated wild animals are likely to have been exposed to diseases and parasites. If returned to the wild, these animals may infect other wild animals, thus causing serious, and potentially irreversible, problems.
4. In many instances, confiscated wild animals have been moved great distances from the site of capture and changed hands several times, such that their actual provenance is unknown. It may, therefore, be impossible or very difficult to establish an appropriate site for return to the wild that takes into account the ecological needs of the species, the animals' genetic make-up, and other attributes that are important to minimize risks (e.g., competition, hybridization) to wild populations at a release site.
5. in cases where the provenance is known, the ecological niche vacated by that animal may already be filled by other individuals and replacing the animal could result in further undesired disturbance of the ecosystem
6. Responsible programs to return animals to the wild (c.f. IUCN 1998) are long-term endeavors that require substantial human and financial resources; hence, they can divert scarce resources away from other more effective conservation activities.

If returning confiscated animals to the wild is to be consistent with conservation principles and practice, it should a) *only* be into a site outside of the species' natural range if such an action is in accordance with the IUCN Guidelines for Reintroductions for a conservation introduction; and b) only be practiced in cases where the animals are of high conservation value and/or the release is part of a management programme. Any

release to the wild must include the necessary screening and monitoring to address potential negative impacts, as set forth in the IUCN Guidelines for Re-introductions (IUCN 1998).

Retaining confiscated wild animals in captivity is a clear – and, in most cases, preferable - alternative to returning them to the wild. Clearly, returning animals to their owners will be required in cases of theft. There are a number of options for keeping animals in captivity; however, each of these also has costs and risks.

- As confiscated animals are likely to have been exposed to diseases and parasites, if held in captivity, they may infect other captive animals, causing serious, and potentially irreversible, problems.
- Finding an appropriate home for confiscated animals can be time-consuming, and caring for the animals during that time can be expensive.
- Wild animals have specific nutritional requirements and require specific care. Shortterm and long-term humane care of confiscated wild animals requires space, finances and expertise not readily available in many countries.
- Transfer of ownership from a confiscating government authority to a private entity – individual or non-commercial or commercial care facility – can raise complicated legal and ethical issues, which are difficult – and time-consuming - to address. Sale or transfer of ownership may – or may be seen to - stimulate demand for these animals and exacerbate any threat that trade may pose to the species. It may also give the appearance that the government condones illegal or irregular trade or, in the case of actual sale, is benefiting from such trade.
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In addition to avoiding risks to wild populations engendered by return to the wild, keeping confiscated animals in captivity provides other benefits, for example:

- Confiscated animals can be used to educate people about wildlife and conservation, as well as the consequences of trade in live wildlife.
- Confiscated animals placed in captivity can provide breeding stock for zoos, aquariums, and other facilities, thus potentially reducing the demand for wild-caught animals although the opposite effect may also occur.
- In specific instances where the provenance of the confiscated specimens is known, these animals can provide the nucleus, and breeding stock, for possible reintroduction programs.
- Confiscated animals can be the subject of a range of non-invasive research, training and teaching programs with important potential benefits for conservation.

Euthanasia must be considered a valid alternative to placing animals in captivity or returning them to the wild. Although it may appear counter-intuitive to employ euthanasia, it is by definition a humane act and can be wholly consistent with both conservation and animal welfare considerations. Further, although many confiscating authorities may be wary of criticism elicited by a decision to euthanize confiscated animals, there are a number of reasons to justify its use, including the following:

- In many, if not most, circumstances, euthanasia offers the most humane alternative for dealing with confiscated wild animals.
- Euthanasia eliminates the genetic, ecological, and other risks that release to the wild may pose to wild populations and ecosystems.
- Euthanasia eliminates the serious risk of spreading disease to wild or captive populations of animals.
- Euthanasia will often be the least costly option.

Establishment of an overall policy framework, with specific procedures for confiscating authorities, will facilitate consideration of the above three options for disposition, including the logistical, legal, and ethical questions that these authorities must address.

IUCN Guidelines for the Placement of Confiscated Animals

Statement of Principle

When live wild animals[1] are confiscated by government authorities, these authorities have a responsibility to dispose of them appropriately. Within a conservation context, and the confines of national and international law, the ultimate decision on placement of confiscated animals must achieve three goals: 1) to maximise the conservation value of the animals without in any way endangering the health, behavioral repertoire, genetic characteristics, or conservation status of wild or captive populations of the species[2] or any other wild living organism; 2) to discourage further illegal or irregular[3] trade in the species; and 3) to provide a humane solution, whether this involves maintaining the animals in captivity, returning them to the wild, or employing euthanasia to destroy them.

Statement of Need

Increased regulation of trade in wildlife and enforcement of these laws and regulations have resulted in an increase in the number of live wild animals that are confiscated by government agencies as a result of non-compliance with these regulations. In some instances, the confiscation is a result of patently illegal trade; in others, it is in response to other irregularities. While in some cases the number of confiscated animals is small, in many others the number is in the hundreds or greater. The large numbers involved, and the need to care for and dispose of them responsibly, have placed serious pressures on confiscating authorities, many of whom lack the technical, financial or human resources or the necessary frameworks to address these situations adequately.

In many countries, the practice has generally been to donate confiscated[4] animals to zoos or aquaria. However, this option is proving less viable. Zoos and aquaria generally cannot accommodate large numbers of animals that become available through confiscations. In addition to the resources required to house them and administer veterinary and other care, these institutions are usually less interested in the common species that comprise the vast proportion of wildlife confiscations. The international zoo community has recognized that placing animals of low conservation priority in limited cage space may benefit those individuals but may also detract from conservation efforts as a whole. Therefore, they are setting priorities for cage space (IUDZG/CBSG 1993), thus reducing their availability to receive confiscated animals. There has been an increasing tendency to address the problem of disposition of confiscated animals by releasing them back into the wild. In some cases, release of confiscated animals into existing wild populations has been made after careful evaluation and with due regard for existing general guidelines (IUCN 1987, IUCN 1998). In other cases, such releases have not been well planned and have been inconsistent with general conservation objectives and humane considerations. Animals released in inappropriate habitat are usually doomed to starvation or death from other causes that the

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[1] In these Guidelines, unless stated otherwise, confiscated animals should be understood to refer to live wild animals, not those that have been captive-bred.

[2] Although this document refers to species, in the case of species with well-defined subspecies , the issues addressed will apply to lower taxonomic units.

[3] Irregular trade in a species refers to, for example, insufficient or incomplete paperwork from the exporting country or poor packing that has comprised the welfare of the live animals in the shipment.

[4] Although not discussed here, it should be understood that, depending on the statutory authority of the agencies involved, animals may first be seized and then confiscated only on completion of legal proceedings resulting in forfeiture by the individual having previously claimed ownership of the animals.

animals are not equipped or adapted against. In addition to humane concerns, release into wild populations may also have strong negative conservation value by threatening existing wild populations for the following reasons.

1) Animals released into the wild outside their natural range can become pests or invasive, thus threatening agriculture and other sectors, native species, and the ecological integrity of the area in which they become established. The effects of invasive alien species are a major cause of global biodiversity loss.
2) The former home range of a confiscated animal may be quickly occupied by other individuals and releasing the confiscated animal could lead to further disruption of the animal's social ecology.
3) Diseases and parasites acquired by confiscated animals while held in captivity can easily spread into existing wild populations if these animals are released.
4) Individuals released into existing populations, or in areas near to existing populations, that are not of the same race or sub-species as those in the wild population, results in mixing of distinct genetic lineages.
5) Animals held in captivity, particularly immature animals, can acquire an inappropriate behavioral repertoire from individuals of other species, and/or lose certain behaviors or not develop the full behavioral repertoire necessary for survival in the wild. It is also possible that release of animals could result in inter-specific hybridization, a problem also to be avoided.

In light of these trends, there is an increasing demand -- and urgent need -- for information and advice on considerations relating to responsible placement of confiscated animals. There is also a pressing need for technical expertise and assistance in assessing the veterinary, husbandry and other questions that must be addressed in this process. Recognizing this problem, the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) have adopted guidelines for Disposal of Confiscated Live Specimens of Species Included in the Appendices (Resolution Conf. 10.7), applicable to both plants and animals. These IUCN guidelines build on and supplement those drawn up by CITES to apply more broadly to confiscated animals and confiscation situations.

Disposition of confiscated animals is not a simple or straightforward process. Only on rare occasions will the optimum course be obvious or result in an action of conservation value. Options for disposition of confiscated animals have thus far been influenced by the public's perception that returning animals to the wild is the optimal solution in terms of both animal welfare and conservation. However, a growing body of scientific study of re-introduction of captive animals, the nature and dynamics of wildlife diseases, and the nature and extent of the problems associated with invasive species suggests that such actions may be among the least appropriate options for many reasons, including those enumerated above. This recognition requires that the options available to confiscating authorities for disposition be carefully reviewed.

Management Options

I n deciding on the disposition of confiscated animals, there is a need to ensure both the humane treatment of the animals and the conservation and welfare of existing wild populations. Options for disposition fall into three principal categories: 1) maintenance of the individual(s) in captivity; 2) returning the individual(s) in question to the wild; and 3) euthanasia.

Within a conservation perspective, by far the most important consideration in reviewing the options for disposition of confiscated animals is the conservation status of the species concerned. Where the animals represent an endangered or threatened species or are otherwise of high conservation value[5], particular

[5] It is recognized that "conservation value" may not always be easy to assess and may be a function of species' status at national or regional level as much as international level (e.g., listed as threatened by IUCN).

effort should be directed towards evaluating whether and how these animals might contribute to a conservation program for the species. The expense and difficulty of returning animals to the wild as part of a conservation (c.f. IUCN 1998) or management program or pursuing certain captive options will generally only be justified for species of high conservation value. How to allocate resources to the large numbers of confiscated animals representing common species is one of the fundamental policy questions that confiscating authorities must address.
The decision as to which option to employ in the disposition of confiscated animals will depend on various legal, social, economic and biological factors. The "Decision Tree" provided in the present guidelines is intended to facilitate consideration of these options. The tree has been designed so that it may be used for both threatened and common species. However, it recognizes that that conservation value of the species will be the primary consideration affecting the options available for placement. International networks of experts, such as the IUCN Species Survival Commission Specialist Groups (see Annex 3 for contact details), should be able to assist confiscating authorities in their deliberations as to the appropriate disposition of confiscated animals.

In some instances, in the case of international trade, there may be a demand for confiscated animals to be returned to their country of origin, and the government authorities of that country may request their return. CITES has established guidelines on this question through Resolution Conf. 10.7. It should be noted that it is often difficult to establish the true origin (including country of origin) of many animals in trade. Moreover, final disposition of confiscated animals upon their return to the country of origin will require consideration of the same options presented here. There is a need for cooperative efforts to review these options in order to ensure that repatriation is not undertaken simply to shift the burden of addressing the problem to the country of origin.

Option 1 -- Captivity

Confiscated animals are already in captivity; there are numerous options for maintaining them there. Depending on the circumstances and the prevailing legal or policy prescriptions, animals. can be donated, loaned, or sold, to public or private facilities, commercial or noncommercial, and to private individuals. Placement can be in the country of origin (or export), country of confiscation, or a country with adequate and/or specialized facilities for the species or animals in question. If animals are maintained in captivity, in preference to being returned to the wild or euthanized, they must be afforded humane conditions and ensured proper care for their natural lives.

Zoos and aquaria are the captive facilities most commonly considered for placement of animals, but these institutions are generally less willing and available to receive such animals than is assumed. As most confiscated animals are common species, the full range of captive options should be considered. These include zoos and aquaria as well as the following:

- **Rescue centers**, established specifically to treat injured or confiscated animals.
- **Life-time care facilities** devoted to the care of confiscated animals.
- **Specialist societies** or clubs devoted to the study and care of single species or species groups (e.g., reptiles, amphibians, birds) have provided an avenue for the disposition of confiscated animals through placement with these societies or individual members.
- **Humane societies** established to care and seek owners for abandoned animals may be in a position to assist with placement of confiscated animals with private individuals who can provide life-time care.
- **Commercial captive breeders** may be willing to receive and care for animals as well as to incorporate them into captive breeding activities. Such facilities, although commercial in nature, are likely to have the technical expertise and other resources to care for the animals. In addition,

production of animals from captive breeding operations may reduce the demand for wild-caught animals.

- **Research institutions** maintain collections of exotic animals for many kinds of research (e.g. behavioral, ecological, physiological, psychological, medical and veterinary). Some research programs have direct relevance to conservation. Attitudes towards vivisection or, in some instances, the non-invasive use of animals in research programs as captive study populations vary widely from country to country and even within countries. These attitudes are likely to affect consideration of such programs as an option for confiscated animals. However, it should be noted that transfer to facilities involved in research conducted under humane conditions may offer an alternative - and one that may eventually contribute information relevant to the species' conservation.

Choosing amongst these options will depend on the conservation value of the animals involved, the condition of the animals, the circumstances of trade in the species, and other factors. As a general rule, where confiscated animals are of high conservation value, an effort should be made to place them in a captive facility that ensures their availability for conservation efforts over the long term, such as with a zoo, ex-situ research program, or an established captive breeding program or facility.

Captivity – Sale, Loan or Donation

Animals can be placed with an institution or individual in a number of ways. It is critical to consider two issues: the ownership of the animals and/or their progeny, and the payment of any fees as part of transfer of ownership. Confiscating authorities and individuals or organizations involved in the placement of confiscated specimens must clarify ownership, both of the specimens being transferred and any progeny. They must also consider the possible implications of payment of fees in terms of public perception and for achieving the purpose of confiscation, which is to penalize and, in so doing, deter illegal and irregular trade. The following points should considered.

Transfer of ownership/custody**.** Unless specific legal provisions apply, the confiscating authority should consider including in an agreement to transfer ownership or custody the conditions under which the transfer is made, such as any restrictions on use (e.g., exhibition, education, captive breeding, commercial or non-commercial) or obligations concerning use (breeding efforts), that the animals may be put to. Such an agreement may set forth conditions relating to:

- subsequent transfer of ownership or custody;
- changes in the use of the animals by the new owner or custodian; and
- consequences of violation of the terms of transfer by the new owner or custodian.

Payment of fees. There may be cases where captive facilities are willing to receive and commit to care for confiscated animals providing payment is made by the confiscating authority against those costs. More frequently, the confiscating authority may seek to recoup the costs of caring for the animals prior to placement by levying a fee as part of transfer of ownership. Such payment of fees is problematic for many reasons, including the following:

- it may weaken the impact of the confiscation as a deterrent;
- it may risk creating a public perception that the confiscating authority is perpetuating or benefiting from illegal or irregular trade; or
- depending on the level of the fees proposed, it may work against finding a suitable option for maintaining the animals in captivity.

It is important that confiscating authorities be prepared to make public the conditions under which ownership of confiscated animals has been transferred and, where applicable, the basis for any payments involved.

Captivity – Benefits

In addition to avoiding the risks associated with attempting to return them to the wild, there are numerous benefits of placing confiscated animals in a facility that will provide life-time care under humane conditions. These include:

a) educational value in terms of possible exhibition or other use;
b) the satisfaction to be derived from the increased chances for survival of the animals;
c) the potential for the animals to be used in a captive breeding program to replace wild-caught animals as a source for trade;
d) the potential for captive breeding for possible re-introduction or other conservation programs; and
e) the potential for use in conservation and other valuable research programs.

Captivity - Concerns

The concerns raised by placing animals in captivity include:

A) DISEASE. Confiscated animals may serve as vectors for disease, which can affect conspecifics and other species held in captivity. As many diseases cannot be screened for, even the strictest quarantine and most extensive screening for disease cannot ensure that an animal is disease-free. Where quarantine cannot adequately ensure that an individual is disease-free, isolation for an indefinite period, or euthanasia, must be carried out.

B) CAPTIVE ANIMALS MAINTAINED OUTSIDE THEIR RANGE CAN ESCAPE from captivity and become pests or invasive. Unintentionally introduced exotic species have become invasive in many countries, causing tremendous damage to agriculture, fisheries, and transport, but also to native animal populations. The decline of the European mink (*Mustela lutreola*), listed as Endangered by IUCN, is in part a result of competition from American mink (*Mustela vison*) escaped from fur farms, while the negative effects of competition from introduced North American red-eared slider turtles (*Trachemys scripta elegans)*, originally imported as pets, have been raised in relation to European and Asian freshwater turtles.

C) COST OF PLACEMENT. Providing housing and veterinary and other care to confiscated animals can be expensive; as a result, it may be difficult to identify institutions or individuals willing to assume these costs.

D) POTENTIAL TO ENCOURAGE UNDESIRED TRADE. As is discussed above, transfer of ownership of confiscated animals to individuals or institutions, whether it involves loan, donation, or sale, is problematic. Some have argued that any transfer of ownership - whether commercial or non-commercial - of confiscated animals risks promoting a market for these species and creating a perception of the confiscating authority's being involved in illegal or irregular trade. These risks must be weighed in relation to the benefits, in particular that maintenance in captivity offers over return to the wild or euthanasia. Some factors that might be considered in assessing the degree to which transfer of ownership – and sale - might promoted undesired trade are:

1) whether the animals in question are already available for sale legally in the confiscating country in commercial quantities; and
2) whether wildlife traders under indictment for, or convicted of, crimes related to illegal or irregular trade in wildlife can be prevented from purchasing the animals in question.
3) the monetary/ commercial value of the animals in question

As regards the latter question, it should be noted that experience in selling confiscated animals suggests that it is virtually impossible to ensure that commercial dealers suspected or implicated in illegal or irregular trade are excluded, directly or indirectly, in purchasing confiscated animals.

In certain circumstances, transfer to commercial captive breeders may have a clearer potential for the conservation of the species, or welfare of the individuals, than non-commercial disposition or euthanasia. In the case of common species, commercial breeders may be a particularly attractive option; in the case of species of high conservation value, this option should be carefully assessed. There may be a risk of stimulating demand from wild populations through increased availability of the species, and it may be difficult to secure access to these animals for future conservation activities.

Option 2 -- Return to the Wild

Because of the serious risks posed to wild animal populations from released confiscated animals, return to the wild is considered here to be a desirable option in only a very small number of instances and under very specific circumstances. The IUCN Guidelines for Reintroductions (IUCN 1998) make a clear distinction between the different options for returning animals to the wild to meet conservation objectives and discuss the purposes, rationale and procedures relating to these options.

The present Guidelines do not consider a viable option the return of animals to the wild except in accordance with the IUCN Guidelines for Re-introductions. Poorly planned or executed release or (re-)introduction programmes are no better than dumping animals in the wild and should be vigorously opposed on both conservation and humane grounds.

A) **Re-introduction**: an attempt to establish a population in an area that was once part of the range of the species but from which it has become extirpated. Some of the best known re-introductions have been of species that had become extinct in the wild. Examples include: Père David's deer (*Elaphurus davidanus*) and the Arabian oryx (*Oryx leucoryx*). Other re-introduction programmes have involved species that persist in some parts of their historical range but have been eliminated from others; the aim of these programs is to re-establish a population in an area, or region, from which the species has disappeared. An example of this type of re-introduction is the recent re-introduction of the swift fox (*Vulpes velox*) in Canada.

B) **Reinforcement of an Existing Population** (also referred to as Supplementation): the addition of individuals to an existing population of the same species.

Reinforcement can be a powerful conservation tool when natural populations are diminished by a process which, at least in theory, can be reversed. One of the few examples of a successful reinforcement project involves the golden lion tamarin (*Leontopithecus rosalia*) in Brazil. Habitat loss, coupled with capture of live animals for pets, resulted in a rapid decline of the golden lion tamarin. When reserves were expanded, and capture for trade curbed, captive-bred golden lion tamarins were then used to supplement depleted wild populations.

Reinforcement has been most widely pursued in the context of rehabilitation programs, i.e., when individual injured animals have been provided with veterinary care and released. Such activities are common in many countries, and specific programs exist for species as diverse as hedgehogs and birds of prey. However common an activity, reinforcement carries with it the very grave risk that individuals held in captivity, even temporarily, are potential vectors for the introduction of disease or infectious organisms into wild populations.

Because of disease and other risks to wild populations, as well as the costs of screening and post-release monitoring, reinforcement should only be employed in instances where there is a direct and measurable conservation benefit (demographically and/or genetically, and/or to enhance conservation in the public's eye), or, at least, where the presumed benefits clearly outweigh these risks.

C) **Conservation Introductions** (also referred to as Beneficial or Benign Introductions): an attempt to establish a species, for the purpose of conservation, outside its recorded distribution but within an appropriate habitat and eco-geographical area. This is a feasible conservation tool only when there is no remaining area left within a species' historic range.

Extensive use of conservation introductions has been made in New Zealand, where endangered birds have been transferred to off-shore islands that were adjacent to, but not part of, the animals' original range. Conservation introductions can also be a component of a larger program of re-introduction, an example being the breeding of red wolves (*Canis rufus*) on islands outside their natural range and subsequent transfer to mainland range areas.

Return to the Wild - Benefits

There are benefits of returning confiscated animals to the wild, providing the pre-requisite veterinary, genetic, and other screening is undertaken and post-release monitoring programs are established (as per IUCN 1998).

a) In situations where the existing population is severely threatened, re-introduction might improve the long-term conservation potential of the species as a whole, or of a local population of the species (e.g., golden lion tamarins).
b) Return to the wild makes a strong political/educational statement concerning the fate of animals and may serve to promote local conservation values. However, as part of any education or public awareness programmes, the costs and difficulties associated with the return to the wild must be emphasized.
c) Species returned to the wild have the possibility of continuing to fulfill their biological and ecological roles.

Return to the Wild - Concerns

As indicated above, because of the risk of biological invasion, these guidelines do not consider it a viable option to return animals to the wild outside of their natural range in any but the most exceptional circumstances. Before return to the wild (as per IUCN 1998) of confiscated animals is considered, several issues of concern must be considered in general terms: welfare, conservation value, cost, and disease.

A) WELFARE. While some consider return to the wild to be humane, ill-conceived projects may return animals to the wild which then die from starvation or do not adapt to an unfamiliar or inappropriate environment. Humane considerations require that each effort to return confiscated animals to the wild be thoroughly researched and carefully planned. Reintroduction projects also require long-term commitment in terms of monitoring the fate of released individuals.

I n order for return to the wild to be seriously considered on welfare grounds, some have advocated that the survival prospects for released animals must at least approximate those of wild animals of the same sex and age. While such demographic data on wild populations are rarely available, the spirit of this suggestion should be respected -- there must be humane treatment of confiscated animals when attempting to return them to the wild, and there should be a reasonable assessment of the survival prospects of the animals to justify the risks involved.

B) CONSERVATION VALUE AND COST. In cases where returning confiscated animals to the wild appears to be the most humane option, such action can only be undertaken if it does not threaten existing populations of con-specifics or populations of other interacting species, or the ecological integrity of the area in which they live. The conservation of the species as a whole, and of other animals already living free, must take precedent over the welfare of individual animals that are already in captivity.

Before animals are used in programs in which existing populations are reinforced, or new populations are established, it must be determined that returning these individuals to the wild will make a significant contribution to the conservation of the species, or populations of other interacting species, or it must serve a purpose directly related to the conservation and management of the species or ecosystem involved. Based solely on demographic considerations, large populations are less likely to go extinct, and, therefore, reinforcing existing very small wild populations may reduce the probability of extinction. In very small populations, a lack of males or females may result in reduced population growth or population decline and, therefore, reinforcing a very small population lacking animals of a particular sex may also improve prospects for survival of that population. However, genetic and behavioural considerations, as well as the possibility of disease introduction, also play a fundamental role in determining the long-term survival of a population. The potential conservation benefit of the re-introduction should clearly outweigh the risks.

The cost of returning animals to the wild in a responsible manner can be prohibitive, suggesting that this option should only be pursued when species are of high conservation value. Exceptions to this rule may be instances where the confiscated animals are not of high conservation value, but the circumstances and technical and other resources are available to ensure re-introduction is undertaken in accordance with conservation guidelines (e.g., IUCN 1998)

C) DISEASE. Animals held in captivity and/or transported, even for a very short time, may be exposed to a variety of pathogens. Release of these animals to the wild may result in introduction of disease to con-specifics or unrelated species with potentially catastrophic effects. Even if there is a very small risk that confiscated animals have been infected by exotic pathogens, the potential effects of introduced diseases on wild populations are often so great that this should preclude returning confiscated animals to the wild.

Release into the wild of any animal that has been held in captivity is risky. Animals held in captivity are more likely to acquire diseases and parasites. While some of these diseases can be tested for, tests do not exist for many animal diseases. Furthermore, animals held in captivity are frequently exposed to diseases not usually encountered in their natural habitat. Veterinarians and quarantine officers, thinking that the species in question is only susceptible to certain diseases, might not test for the diseases picked up in captivity. It should be assumed that all diseases are potentially contagious.

In assessing the possibilities for disease, it may be particularly helpful to consider the known or presumed circumstances of trade, including:

a) the time and distance from point of capture; the number of stages of trade and types of transport;
b) whether the animals have been held or transported in proximity to wild or domesticated animals of the same or other species and what specific diseases have been known to be carried by such animals.

D) SOURCE OF INDIVIDUALS. If the precise provenance of the confiscated animals is not known (they may be from several different sites of origin), or if there is any question of the source of animals, supplementation may lead to inadvertent pollution of distinct genetic races or subspecies. If particular local races or sub-species show specific adaptation to their local environments, mixing in individuals from other races or sub-species may be damaging to the local population. Where the origin and habitat and ecological requirements of the species are unknown, introducing an individual or individuals into the wrong habitat type may also doom them to death.

Given that any release incurs some risk, the following "precautionary principle" should be adopted: ***if there is no conservation value in releasing confiscated animals to the wild or no management program exists within which such release can be undertaken according to conservation guidelines, the possibility of accidentally introducing a disease, or behavioral and genetic aberrations that are not already present into the environment,***

however unlikely, should rule out returning confiscated specimens to the wild as a placement option.

Option 3 -- Euthanasia

Euthanasia -- the killing of animals carried out according to humane guidelines -- is a valid alternative to maintaining animals in captivity or returning them to the wild. Although it may appear counter-intuitive to employ euthanasia, it is, by definition, humane, and, thus can be wholly consistent with conservation and animal considerations. In many cases, it may be the most feasible option for conservation and humane, as well as economic, reasons. It is recognized that euthanasia is unlikely to be a popular option amongst confiscating authorities for disposition of confiscated animals. However, it cannot be overstressed that it may be the most responsible option. In many cases, authorities confiscating live animals will encounter the following situations:

a) In the course of trade or while held in captivity, the animals have contracted a chronic disease that is incurable and poses a risk to other animals, whether held in captivity or in the wild.
b) The actual provenance of the animals is unknown, and there is evidence to suggest that there may be genetic or other differences between them and presumed conspecifics in the wild, which could compromise the integrity of wild and captive populations, including those involved in breeding or conservation research activities.
c) There are insufficient resources to return the animals to the wild in accordance with biological (e.g., IUCN 1998) and animal welfare (e.g., International Academy of Animal Welfare Sciences 1992) guidelines.
d) There are no feasible options for maintaining the animals in captivity.

In these instances, euthanasia may be the only responsible option and, thus, should be employed.

Euthanasia-- Benefits

a) With respect to the conservation of the species in question and of captive and wild populations of animals, euthanasia carries far fewer risks (e.g. disease, genetic pollution, biological invasion) than maintenance in captivity or return to the wild.
b) Euthanasia may be the best (and only) possible solution to an acute problem with confiscated animals. Many possibilities for maintenance in captivity may not guarantee the animals' welfare over the long term, and the survival prospects of animals returned to the wild are generally not high, as, depending on the circumstances, such animals often die of starvation, disease or predation.
c) Euthanasia acts to discourage the activities that gave rise to confiscation, as the animals in question are completely lost to the trade, with no chance of recovery by the traders involved. This removes any potential monetary gain from illegal trade. In addition, euthanasia may serve as a broader deterrent, in educating the public and other sectors about the serious and complex problems that can arise from trade in live wild animals.
d) The choice of euthanasia over maintenance in captivity or return to the wild offers an opportunity for confiscating authorities and other agencies to educate the public about more esoteric conservation problems, including those relating to invasive species and the potential negative consequences of releasing animals to the wild without adequate safeguards. Increased public awareness may generate additional ideas on placement of confiscated animals.
e) Euthanasia can be inexpensive as compared to other options. As such, it does not divert human and financial resources that could be allocated to other conservation or related activities, such as re-introduction or lifetime care of other animals, or the conservation of threatened species in the wild.

When animals are euthanized, or die in captivity, an effort should be made to make the best use of the dead specimens for scientific purposes, such as placing them in a reference collection in a university or

research institute, which are very important for the study of biodiversity, or making them available for pathology or other research.

Euthanasia- Risks

A) Just as there is potential positive educational value in employing euthanasia, there is a problem that it may give rise to negative perceptions of the confiscating authority for having taken that decision over other options. In such instances, there is a need to foresee such criticism and offer the rationale for the decision to euthanize.
B) There is a risk of losing unique behavioral, genetic and ecological material within an individual or group of individuals that represents variation within a species and may be of value for the conservation of the species.

Establishing the Necessary Frameworks

In order for prospective confiscating agencies to address the logistical, legal and other difficulties resulting from the seizure of wild animals, their eventual confiscation, and responsible disposition based on the above three options, there should be established an overall policy framework and specific procedures that *inter alia*:

- Identify the authority or authorities with responsibility for confiscation and placement of wild animals;
- Identify or provide the basis for establishing the facilities that will receive and, as necessary, quarantine, seized animals and hold them until final disposition is decided;
- Identify government or non-government agencies and experts that can assist in the identification, care, and screening of the seized or confiscated animals and assist in the process of deciding on appropriate disposition;
- Identify institutions, agencies, and private individuals and societies who can provide assistance to confiscating authorities in disposing of confiscated animals (including humane euthanasia) or can receive such animals;
- Elaborate on and provide for the implementation of the above guidelines in terms of specific legal and regulatory provisions and administrative procedures concerning transfer of ownership (including sale) of confiscated animals, short-term (e.g., upon seizure) and long-term (e.g., post-confiscation) care, levying of fees and other payments for care of confiscated animals, and other considerations that may be required to ensure that confiscated wild animals are disposed of responsibly in terms of both their welfare and the conservation.
- Produce and implement written policies on disposal of confiscated wildlife, taking steps to ensure that all enforcement personnel are provided the necessary resources to implement the policy.

Decision Tree Analysis

For decision trees dealing with "Return to the Wild" and "Captive Options," the confiscating party must first ask the question:

Question 1: Will "Return to the Wild" make a significant contribution to the conservation of the species? Is there a management program that has sufficient resources to enable return according to IUCN Re-introduction Guidelines?

The most important consideration in deciding on placement of confiscated specimens is the conservation value of the specimen in question. Conservation interests are best served by ensuring the survival of as many individuals as possible; hence, the re-introduction of confiscated animals must improve the prospects for survival of the wild population. Reintroducing animals that have been held in captivity will always involve some level of risk to populations of the same or other species in the ecosystem, because

there can never be absolute certainty that a confiscated animal is disease- and parasite-free. If the specimen is not of conservation value, the costs of re-introducing the animals to the wild may divert resources away from conservation programmes for other species or more effective conservation activities. In most instances, the benefits of return to the wild will be outweighed by the costs and risks of such an action. If returning animals to the wild is not of conservation value, captive options pose fewer risks and may offer more humane alternatives.

Q1 Answer: **Yes:** Investigate "Return to the Wild" Options.
No: Investigate "Captive Options".

DECISION TREE ANALYSIS - CAPTIVITY

The decision to maintain confiscated animals in captivity involves a simpler set of considerations than that involving attempts to return confiscated animals to the wild.

Question 2: Have animals been subjected to comprehensive veterinary screening and quarantine?

Animals that may be transferred to captive facilities must have a clean bill of health because of the risk of introducing disease to captive populations. This should be established through quarantine and screening.

Q2 Answer: **Yes**: Proceed to Question 3.
No: Quarantine and screen, and proceed to Question 3

Question 3: Have animals been found to be disease-free by comprehensive veterinary screening and quarantine, or can they be treated for any infection discovered?

If, during quarantine, the animals are found to harbour diseases that cannot reasonably be cured, they must be euthanized to prevent infection of other animals. If the animals are suspected to have come into contact with diseases for which screening is impossible, extended quarantine, transfer to a research facility, or euthanasia must be considered.

Q3 Answer: **Yes**: Proceed to Question 4
No: If chronic and incurable infection exists, first offer animals to research institutions. If impossible to place in such institutions, euthanize.

Question 4: Are there grounds for concern that certain options for transfer will stimulate further illegal or irregular trade or reduce the effectiveness of confiscation as a deterrent to such trade?

As much as possible, the confiscating authority should be satisfied that:

1) those involved in the illegal or irregular transaction that gave rise to confiscation cannot obtain the animals proposed for transfer;
2) the transfer does not compromise the objective of confiscation; and
3) the transfer will not increase illegal, irregular or otherwise undesired trade in the species.

What options can guarantee this will depend on the conservation status of the species in question, the nature of the trade in that species, and the circumstances of the specific incident that gave rise to confiscation. The payment of fees – to or by the confiscating authority – will complicate this assessment. Confiscating authorities must consider the various options for transfer in light of these concerns and weigh them against potential benefits that certain options might offer.

Q4 Answer: **Yes**: Proceed to Question 5a.
No: Proceed to Question 5b.

Question 5a: Is space available with a captive facility where the benefits of placement will outweigh concerns about the risks associated with transfer?
Question 5b: Is space available in a captive facility that offers particular benefits for the animals in question or the species?

There are a range of options for placement of confiscated animals in captivity, including public and private facilities, either commercial or non-commercial, specialist societies and individuals. Where several options for placement exist, it may be helpful to consider which offers the opportunity to maximize the conservation value of the animals, such as involvement in a conservation education or research program or a captive-breeding program. The conservation potential must be carefully weighed against the risk of stimulating trade that could exert further pressure on the wild population of the species.

Although placement with a commercial captive-breeding operation has the potential to reduce demand for wild-caught animals, this option should be carefully assessed: it may be difficult to monitor these facilities, and such programs may, unintentionally or intentionally, stimulate trade in wild animals. In many countries, there are active specialist societies or clubs of individuals with considerable expertise in the husbandry and breeding of individual species or groups of species. Such societies can assist in finding homes for confiscated animals with individuals who have expertise in the husbandry of those species

When a choice must be made between several options, the paramount consideration should be which option can:

1) offer the opportunity for the animals to participate in a programme that may benefit the conservation of the species;
2) provide the most consistent care; and
3)\ ensure the welfare of the animals.

In instances, where no facilities are available in the country in which animals are confiscated, transfer to a captive facility outside the country of confiscation may be possible. Whether to pursue this will depend on the conservation value of the species or the extent of interest in it. An important consideration in assessing this option is the cost involved and the extent to which these resources may be more effectively allocated to other conservation efforts.

The confiscating authorities should conclude an agreement to transfer confiscated animals to captive facilities. This agreement should set forth the terms and conditions of the transfer, including:

a) restrictions on any use (e.g., exhibition, education, captive breeding), commercial or non-commercial, that the animals may be put to;
b) a commitment to ensure life-time care or, in the event that this becomes impossible, transfer to another facility that can ensure life-time care, or to euthanize the animals; and
c) conditions regarding subsequent transfer of ownership, including sale, of the animals or their offspring.

Q5 Answer: **Yes**: Execute agreement and sell.
No: Proceed to Question 6.

Question 6: Are institutions interested in animals for research under humane conditions?

Many research institutions maintain collections of exotic animals for research conducted under humane conditions. If these animals are kept in conditions that ensure their welfare, transfer to such institutions

may provide an acceptable alternative to other options, such as transfer to another captive facility or euthanasia. As in the preceding instances, such transfer should be subject to terms and conditions agreed with the confiscating authority; in addition to those already suggested, it may be advisable to include terms that stipulate the types of research the confiscating authority considers permissible. If no placement is possible, the animals should be euthanized.

Q6 Answer: **Yes**: Execute Agreement and Transfer.
No: Euthanize.

DECISION TREE ANALYSIS -- RETURN TO THE WILD

Question 2: Have animals been subjected to a comprehensive veterinary screening and quarantine?

Because of the risk of introducing disease to wild populations, confiscated animals that may be released must have a clean bill of health. The animals must be placed in quarantine to determine if they are disease-free before being considered for released.

Q2 Answer: **Yes**: Proceed to Question 3.
No: Quarantine and screen, and proceed to Question 3.

Question 3: Have animals been found to be disease-free by comprehensive veterinary screening and quarantine, or can they be treated for any infection discovered?

If, during quarantine, the confiscated animals are found to harbour diseases that cannot reasonably be cured, unless any institutions are interested in the animals for research under humane conditions, they must be euthanized to prevent infection of other animals. If the animals are suspected to have come into contact with diseases for which screening is impossible, extended quarantine, donation to a research facility, or ethanasia must be considered.

Q3 Answer: **Yes**: Proceed to Question 4
No: If chronic and incurable infection exists, first offer animals to research institutions. If impossible to place in such institutions, euthanize.

Question 4: Can the country of origin and site of capture be confirmed?

The geographical location from which confiscated animals have been removed from the wild must be determined if these individuals are to be used to reinforce existing wild populations. As a general rule, animals should only be returned to the population from which they were taken, or from populations that are known to have natural exchange of individuals with this population.

If provenance of the animals is not known, release for reinforcement may lead to inadvertent hybridization of distinct genetic races or sub-species. Related species of animals that may live in sympatry in the wild and never hybridize have been known to hybridize when held in captivity in multi-species groups. This type of generalization of species recognition under abnormal conditions can result in behavioral problems, which can compromise the success of any future release and also pose a threat to wild populations by artificially destroying reproductive isolation that is behaviorally mediated.

Q4 Answer: **Yes**: Proceed to Question 5.
No: Pursue 'Captive Options'.

Question 5: Do the animals exhibit behavioural abnormalities that might make them unsuitable for return to the wild?

Behavioral abnormalities as a result of captivity can render animals unsuitable for release into the wild. A wide variety of behavioral traits and specific behavioral skills are necessary for survival, in the short-term for the individual, and in the long-term for the population. Skills for hunting, avoiding predators, food selectivity, etc. are necessary to ensure survival.

Q5 Answer: **Yes**: Pursue 'Captive Options'.
No: Proceed to Question 6.

Question 6: Can the animals be returned expeditiously to their site of origin (specific location), and will benefits to conservation of the species outweigh any risks of such action?

Return of the animals to the wild through reinforcement of the wild population should follow the IUCN Re-introduction Guidelines and will only be an option under certain conditions, including:

a) appropriate habitat for such an operation still exists in the specific location that the individual was removed from; and
b) sufficient funds are available, or can be made available.

Q6 Answer: **Yes**: Re-inforce at origin (specific location) following IUCN Guidelines.
No: Proceed to Question 7.

Question 7: For the species in question, does a generally recognized program exist the aim of which is conservation of the species and eventual return to the wild of confiscated individuals and/or their progeny? *Contact IUCN/SSC, IIUDZG, Studbook Keeper, or Breeding Program Coordinator (See Annex 3).*

In the case of species for which active captive breeding and/or re-introduction programs exist, and for which further breeding stock/founders are required, confiscated animals should be transferred to such programs after consultation with the appropriate scientific authorities. If the species in question is part of a captive breeding program, but the taxon (sub-species or race) is not part of this program, other methods of disposition must be considered. Particular attention should be paid to genetic screening to avoid jeopardizing captive breeding programs through inadvertent hybridisation.

Q7 Answer: **Yes**: Execute agreement and transfer to existing programme.
No: Proceed to Question 8.

Question 8: Is there a need, and is it feasible to establish a new re-introduction program *following IUCN Guidelines*?

In cases where individuals cannot be transferred to existing re-introduction programs, reintroduction following IUCN Guidelines, may be possible, providing:

a) appropriate habitat exists for such an operation;
b) sufficient funds are available, or can be made available, to support a program over the many years that (re)introduction will require; and

c) sufficient numbers of animals are available so that re-introduction efforts are potentially viable.

In the majority of cases, at least one, if not all, of these requirements will fail to be met. In this instance, either conservation introductions outside the historical range of the species or other options for disposition of the animals must be considered.

If a particular species is confiscated with some frequency, consideration should be made as to whether to establish a re-introduction, reinforcement, or introduction program for that species. Animals should not be held by the confiscating authority indefinitely while such programs are planned, but should be transferred to a holding facility after consultation with the organization which is establishing the new program.

Q8 Answer: **Yes**: Execute agreement and transfer to holding facility or new program.
No: Pursue 'Captive Options'.

Relevant Documents

CITES. 1997. Resolution Conf. 10.7: Disposal of Confiscated Live Specimens of Species Included in the Appendices. Adopted at the Tenth Meeting of the Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (Harare, 1997). (Available from CITES Secretariat or from http://www.cites.org)

IUCN. 1987. *The IUCN position statement on translocation of living organisms: introductions, re-introductions and restocking*. IUCN, Gland, Switzerland. (Available from IUCN/SSC or from http://iucn.org/themes/ssc/PUBS/POLICY/INDEX.HTM)

IUCN. 1998. *IUCN Guidelines for Re-introductions.* Prepared by the IUCN/SSC Reintroductions Specialist Group. IUCN, Gland Switzerland and Cambridge, UK. (Available from IUCN Publications Services Unit or from http://iucn.org./themes/ssc/PUBS/POLICY/INDEX.HTM)

IUCN. IUCN Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species. Prepared by the IUCN/SSC Invasive Species Specialist Group. IUCN, Gland, Switzerland. Available from http://iucn.org/themes/ssc/pubs/policy/invasivesEng.htm

IUDZG/CBSG. 1993. *The World Zoo Conservation Strategy. The Role of Zoos and Aquaria of the World in Global Conservation*. IUDZG-the World Zoo Organization.

IUCN Position Statement on Translocation of Living Organisms:
INTRODUCTIONS, REINTRODUCTIONS AND RE-STOCKING

Prepared by the Species Survival Commission in collaboration with the Commission on Ecology, and the Commission on Environmental Policy, Law and Administration
Approved by the 22nd Meeting of the IUCN Council, Gland, Switzerland, 4 September 1987

FOREWORD

This statement sets out IUCN's position on translocation of living organisms, covering introductions, re-introductions and re-stocking. The implications of these three sorts of translocation are very different so the paper is divided into four parts dealing with Introductions, Re-introductions, Re-stocking and Administrative Implications, respectively.

DEFINITIONS:

Translocation is the movement of living organisms from one area with free release in another. The three main classes of translocation distinguished in this document are defined as follows:

- **Introduction** of an organism is the intentional or accidental dispersal by human agency of a living organism outside its historically known native range.
- **Re-introduction** of an organism is the intentional movement of an organism into a part of its native range from which it has disappeared or become extirpated in historic times as a result of human activities or natural catastrophe.
- **Re-stocking** is the movement of numbers of plants or animals of a species with the intention of building up the number of individuals of that species in an original habitat.

Translocations are powerful tools for the management of the natural and man made environment which, properly used, can bring great benefits to natural biological systems and to man, but like other powerful tools they have the potential to cause enormous damage if misused. This IUCN statement describes the advantageous uses of translocations and the work and precautions needed to avoid the disastrous consequences of poorly planned translocations.

PART I

INTRODUCTIONS

BACKGROUND

Non-native (exotic) species have been introduced into areas where they did not formerly exist for a variety of reasons, such as economic development, improvement of hunting and fishing, ornamentation, or maintenance of the cultures of migrated human communities. The damage done by harmful introductions to natural systems far outweighs the benefit derived from them. The introduction and establishment of alien species in areas where they did not formerly occur, as an accidental or intended result of human activities, has often been directly harmful to the native plants and animals of many parts of the world and to the welfare of mankind.

The establishment of introduced alien species has broken down the genetic isolation of communities of co-evolving species of plants and animals. Such isolation has been essential for the evolution and maintenance of the diversity of plants and animals composing the biological wealth of our planet. Disturbance of this isolation by alien species has interfered with the dynamics of natural systems causing the premature extinction of species. Especially successful and aggressive invasive species of plants and

animals increasingly dominate large areas having replaced diverse autochthonous communities. Islands, in the broad sense, including isolated biological systems such as lakes or isolated mountains, are especially vulnerable to introductions because their often simple ecosystems offer refuge for species that are not aggressive competitors. As a result of their isolation they are of special value because of high endemism (relatively large numbers of unique local forms) evolved under the particular conditions of these islands over a long period of time. These endemic species are often rare and highly specialised in their ecological requirements and may be remnants of extensive communities from bygone ages, as exemplified by the Pleistocene refugia of Africa and Amazonia.

The diversity of plants and animals in the natural world is becoming increasingly important to man as their demands on the natural world increase in both quantity and variety, notwithstanding their dependence on crops and domestic animals nurtured within an increasingly uniform artificial and consequently vulnerable agricultural environment.

Introductions, can be beneficial to man. Nevertheless the following sections define areas in which the introduction of alien organisms is not conducive to good management, and describe the sorts of decisions that should be made before introduction of an alien species is made.

To reduce the damaging impact of introductions on the balance of natural systems, governments should provide the legal authority and administrative support that will promote implementation of the following approach.

Intentional Introduction

General

1. Introduction of an alien species should only be considered if clear and well defined benefits to man or natural communities can be foreseen.
2. Introduction of an alien species should only be considered if no native species is considered suitable for the purpose for which the introduction is being made.

Introductions to Natural Habitats

3. No alien species should be deliberately introduced into any natural habitat, island, lake, sea, ocean or centre of endemism, whether within or beyond the limits of national jurisdiction. A natural habitat is defined as a habitat not perceptibly altered by man. Where it would be effective, such areas should be surrounded by a buffer zone sufficiently large to prevent unaided spread of alien species from nearby areas. No alien introduction should be made within the buffer zone if it is likely to spread into neighbouring natural areas.

Introduction into Semi-natural Habitat

4. No alien species should be introduced into a semi-natural habitat unless there are exceptional reasons for doing so , and only when the operation has been comprehensively investigated and carefully planned in advance. A semi-natural habitat is one which has been detectably changed by man's actions or one which is managed by man, but still resembles a natural habitat in the diversity of its species and the complexity of their interrelationships. This excludes arable farm land, planted ley pasture and timber plantations.

Introductions into Man-made Habitat

5. An assessment should be made of the effects on surrounding natural and semi-natural habitats of the introduction of any species, sub-species, or variety of plant to artificial, arable, ley pasture or other predominantly monocultural forest systems. Appropriate action should be taken to minimise negative effects.

Planning a Beneficial introduction

6. Essential features of investigation and planning consist of:
    - an assessment phase culminating in a decision on the desirability of the introduction;

- an experimental, controlled trial;
- the extensive introduction phase with monitoring and follow-up.

THE ASSESSMENT PHASE

Investigation and planning should take the following factors into account:

a) No species should be considered for introduction to a new habitat until the factors which limit its distribution and abundance in its native range have been thoroughly studied and understood by competent ecologists and its probable dispersal pattern appraised.

Special attention should be paid to the following questions:

- What is the probability of the exotic species increasing in numbers so that it causes damage to the environment, especially to the biotic community into which it will be introduced?
- What is the probability that the exotic species will spread and invade habitats besides those into which the introduction is planned? Special attention should be paid to the exotic species' mode of dispersal.
- How will the introduction of the exotic proceed during all phases of the biological and climatic cycles of the area where the introduction is planned? It has been found that fire, drought and flood can greatly alter the rate of propagation and spread of plants.
- What is the capacity of the species to eradicate or reduce native species by interbreeding with them?
- Will an exotic plant interbreed with a native species to produce new species of aggressive polyploid invader? Polyploid plants often have the capacity to produce varied offspring some of which quickly adapt to and dominate, native floras and cultivars alike.
- Is the alien species the host to diseases or parasites communicable to other flora and fauna, man, their crops or domestic animals, in the area of introduction?
- What is the probability that the species to be introduced will threaten the continued existence or stability of populations of native species, whether as a predator, competitor for food, cover, breeding sites or in any other way? If the introduced species is a carnivore, parasite or specialised herbivore, it should not be introduced if its food includes rare native species that could be adversely affected.

b) There are special problems to be considered associated with the introduction of aquatic species. These species have a special potential for invasive spread.

- Many fish change trophic level or diet preference following introduction, making prediction of the results of the re-introduction difficult. Introduction of a fish or other species at one point on a river system or into the sea may lead to the spread of the species throughout the system or area with unpredictable consequences for native animals and plants. Flooding may transport introduced species from one river system to another.
- introduced fish and large aquatic invertebrates have shown a great capacity to disrupt natural systems as their larval, sub-adult and adult forms often use different parts of the same natural system.

c) No introduction should be made for which a control does not exist or is not possible. A risk-and-threat analysis should be undertaken including investigation of the availability of methods for the control of the introduction should it expand in a way not predicted or have unpredicted undesirable effects, and the methods of control should be socially acceptable, efficient, should not damage vegetation and fauna, man, his domestic animals or cultivars.

d)When the questions above have been answered and the problems carefully considered, it should be decided if the species can reasonably be expected to survive in its new habitat, and if so, if it can

reasonably be expected to enhance the flora and fauna of the area, or the economic or aesthetic value of the area, and whether these benefits outweigh the possible disadvantages revealed by the investigations.

THE EXPERIMENTAL CONTROLLED TRIAL

Following a decision to introduce a species, a controlled experimental introduction should be made observing the following advice:

- Test plants and animals should be from the same stock as those intended to be extensively introduced.
- They should be free of diseases and parasites communicable to native species, man, his crops and domestic livestock.
- The introduced species' performance on parameters in 'the Assessment Phase' above should be compared with the pre-trial assessment, and the suitability of the species for introduction should be reviewed in light of the comparison.

THE EXTENSIVE INTRODUCTION

If the introduced species behaves as predicted under the experimental conditions, then extensive introductions may commence but should be closely monitored. Arrangements should be made to apply counter measures to restrict, control, or eradicate the species if necessary.

The results of all phases of the introduction operation should be made public and available to scientists and others interested in the problems of introductions.

The persons or organisation introducing the species, not the public, should bear the cost of control of introduced organisms and appropriate legislation should reflect this.

ACCIDENTAL INTRODUCTIONS

1. Accidental introductions of species are difficult to predict and monitor, nevertheless they "should be discouraged where possible. The following actions are particularly important:
    - On island reserves, including isolated habitats such as lakes, mountain tops and isolated forests, and in wilderness areas, special care should be taken to avoid accidental introductions of seeds of alien plants on shoes and clothing and the introduction of animals especially associated with man, such as cats, dogs, rats and mice.
    - Measures, including legal measures, should be taken to discourage the escape of farmed, including captive-bred, alien wild animals and newly-domesticated species which could breed with their wild ancestors if they escaped.
    - In the interest of both agriculture and wildlife, measures should be taken to control contamination of imported agricultural seed with seeds of weeds and invasive plants.
    - Where large civil engineering projects are envisaged, such as canals, which would link different biogeographical zones, the implications of the linkage for mixing the fauna and flora of the two regions should be carefully considered. An example of this is the mixing of species from the Pacific and Caribbean via the Panama Canal, and the mixing of Red Sea and Mediterranean aquatic organisms via the Suez Canal. Work needs to be done to consider what measures can be taken to restrict mixing of species from different zones through such large developments.

2. Where an accidentally introduced alien successfully and conspicuously propagates itself, the balance of its positive and negative economic and ecological effects should be investigated. If the overall effect is negative, measures should be taken to restrict its spread.

WHERE ALIEN SPECIES ARE ALREADY PRESENT

1. In general, introductions of no apparent benefit to man, but which are having a negative effect on the native flora and fauna into which they have been introduced, should be removed or eradicated. The present ubiquity of introduced species will put effective action against the majority of invasives beyond the means of many States but special efforts should be made to eradicate introductions on:
    - islands with a high percentage of endemics in the flora and fauna;
    - areas which are centres of endemism;
    - areas with a high degree of species diversity;
    - areas with a high degree of other ecological diversity;
    - areas in which a threatened endemic is jeopardised by the presence of the alien.
2. Special attention should be paid to feral animals. These can be some of the most aggressive and damaging alien species to the natural environment, but may have value as an economic or genetic resource in their own right, or be of scientific interest. Where a feral population is believed to have a value in its own right, but is associated with changes in the balance of native vegetation and fauna, the conservation of the native flora and fauna should always take precedence. Removal to captivity or domestication is a valid alternative for the conservation of valuable feral animals consistent with the phase of their evolution as domestic animals.

    Special attention should be paid to the eradication of mammalian feral predators from areas where there are populations of breeding birds or other important populations of wild fauna. Predatory mammals are especially difficult, and sometimes impossible to eradicate, for example, feral cats, dogs, mink, and ferrets.
3. In general, because of the complexity and size of the problem, but especially where feral mammals or several plant invaders are involved, expert advice should be sought on eradication.

BIOLOGICAL CONTROL

1. Biological control of introductions has shown itself to be an effective way of controlling and eradicating introduced species of plants and more rarely, of animals. As biological control involves introduction of alien species, the same care and procedures should be used as with other intentional introductions.

MICRO-ORGANISMS

1. There has recently been an increase of interest in the use of micro-organisms for a wide variety of purposes including those genetically altered by man.
   Where such uses involve the movement of micro-organisms to areas where they did not formerly exist, the same care and procedures should be used as set out above for other species.

PART II

THE RE-INTRODUCTION OF SPECIES*

Re-introduction is the release of a species of animal or plant into an area in which it was indigenous before extermination by human activities or natural catastrophe. Re-introduction is a particularly useful tool for restoring a species to an original habitat where it has become extinct due to human persecution, over-collecting, over-harvesting or habitat deterioration, but where these factors can now be controlled. Re-introductions should only take place where the original causes of extinction have been removed. Re-introductions should only take place where the habitat requirements of the species are satisfied. There should be no re-introduction if a species became extinct because of habitat change which remains unremedied, or where significant habitat deterioration has occurred since the extinction.

The species should only be re-introduced if measures have been taken to reconstitute the habitat to a state suitable for the species.

The basic programme for re-introduction should consist of:

- a feasibility study;
- a preparation phase;
- release or introduction phase; and a
- follow-up phase.

THE FEASIBILITY STUDY

An ecological study should assess the previous relationship of the species to the habitat into which the re-introduction is to take place, and the extent that the habitat has changed since the local extinction of the species. If individuals to be re-introduced have been captive-bred or cultivated, changes in the species should also be taken into account and allowances made for new features liable to affect the ability of the animal or plant to re-adapt to its traditional habitat.

The attitudes of local people must be taken into account especially if the reintroduction of a species that was persecuted, over-hunted or over collected , is proposed. If the attitude of local people is unfavorable an education and interpretive program emphasizing the benefits to them of the re-introduction, or other inducement, should be used to improve their attitude before re-introduction takes place.

The animals or plants involved in the re-introduction must be of the closest available race or type to the original stock and preferably be the same race as that previously occurring in the area.

Before commencing a re-introduction project, sufficient funds must be available to ensure that the project can be completed, including the follow-up phase.

THE PREPARATION AND RELEASE OR INTRODUCTORY PHASES

The successful re-introduction of an animal or plant requires that the biological needs of the species be fulfilled in the area where the release is planned. This requires a detailed knowledge of both the needs of the animal or plant and the ecological dynamics of the area of re-introduction. For this reason the best available scientific advice should be taken at all stages of a species re-introduction.

This need for clear analysis of a number of factors can be clearly seen with reference to introductions of ungulates such as ibex, antelope and deer where re-introduction involves understanding and applying the significance of factors such as the ideal age for re-introducing individuals, ideal sex ratio, season, specifying capture techniques and mode of transport to re-introduction site, freedom of both the species and the area of introduction from disease and parasites, acclimatization, helping animals to learn to forage

in the wild, adjustment of the gut flora to deal with new forage, 'imprinting' on the home range, prevention of wandering of individuals from the site of re-introduction, and on-site breeding in enclosures before release to expand the released population and acclimatize the animals to the site. The re-introduction of other taxa of plants and animals can be expected to be similarly complex.

FOLLOW-UP PHASE

Monitoring of released animals must be an integral part of any re-introduction program. Where possible there should be long-term research to determine the rate of adaptation and dispersal, the need for further releases and identification of the reasons for success or failure of the program.

The species impact on the habitat should be monitored and any action needed to improve conditions identified and taken.

Efforts should be made to make available information on both successful and unsuccessful re-introduction programmed through publications, seminars and other communications.

PART III

RESTOCKING

1. Restocking is the release of a plant or animal species into an area in which it is already present. Restocking may be a useful tool where:
    - it is feared that a small reduced population is becoming dangerously inbred; or
    - where a population has dropped below critical levels and recovery by natural growth will be dangerously slow; or
    - where artificial exchange and artificially-high rates of immigration are required to maintain outbreeding between small isolated populations on biogeographical islands.
2. In such cases care should be taken to ensure that the apparent nonviability of the population, results from the genetic institution of the population and not from poor species management which has allowed deterioration in the habitat or over-utilization of the population. With good management of a population the need for re-stocking should be avoidable but where re-stocking is contemplated the following points should be observed:

    a) Restocking with the aim of conserving a dangerously reduced population should only be attempted when the causes of the reduction have been largely removed and natural increase can be excluded.

    b) Before deciding if restocking is necessary, the capacity of the area it is proposed to restock should be investigated to assess if the level of the population desired is sustainable. If it is, then further work should be undertaken to discover the reasons for the existing low population levels. Action should then be taken to help the resident population expand to the desired level. Only if this fails should restocking be used.
3. Where there are compelling reasons for restocking the following points should be observed.

    a) Attention should be paid to the genetic constitution of stocks used for restocking.

    - In general, genetic manipulation of wild stocks should be kept to a minimum as it may adversely affect the ability of a species or population to survive. Such manipulations

modify the effects of natural selection and ultimately the nature of the species and its ability to survive.

- Genetically impoverished or cloned stocks should not be used to re-stock populations as their ability to survive would be limited by their genetic homogeneity.

b) The animals or plants being used for re-stocking must be of the same race as those in the population into which they are released.

c) Where a species has an extensive natural range and restocking has the aim of conserving a dangerously reduced population at the climatic or ecological edge of its range, care should be taken that only individuals from a similar climatic or ecological zone are used since interbreeding with individuals from an area with a milder climate may interfere with resistant and hardy genotypes on the population's edge.

d) Introduction of stock from zoos may be appropriate, but the breeding history and origin of the animals should be known and follow as closely as possible Assessment Phase guidelines a, b, c and d (see pages 5-7). In addition the dangers of introducing new diseases into wild populations must be avoided: this is particularly important with primates that may carry human zoonoses.

e) Restocking as part of a sustainable use of a resource (e.g. release of a proportion of crocodiles hatched from eggs taken from farms) should follow guidelines a and b (above).

f) Where restocking is contemplated as a humanitarian effort to release or rehabilitate captive animals it is safer to make such releases as re-introductions where there is no danger of infecting wild populations of the same species with new diseases and where there are no problems of animals having to be socially accepted by wild individuals of the species.

PART IV

NATIONAL, INTERNATIONAL AND SCIENTIFIC IMPLICATIONS OF TRANSLOCATIONS

NATIONAL ADMINISTRATION

1. Pre-existing governmental administrative structures and frameworks already in use to protect agriculture, primary industries, wilderness and national parks should be used by governments to control both intentional and unintentional importation of organisms, especially through use of plant and animal quarantine regulations.
2. Governments should set up or utilize pre-existing scientific management authorities or experts in the fields of biology, ecology and natural resource management to advise them on policy matters concerning translocations and on individual cases where an introduction, re-introduction or restocking or farming of wild species is proposed.
3. Governments should formulate national policies on:
    - translocation of wild species;
    - capture and transport of wild animals;
    - artificial propagation of threatened species;
    - selection and propagation of wild species for domestication; and
    - prevention and control of invasive alien species.

4. At the national level legislation is required to curtail introductions:

   Deliberate introductions should be subject to a permit system. The system should apply not only to species introduced from abroad but also to native species introduced to a new area in the same country. It should also apply to restocking.

   Accidental introductions

   - for all potentially harmful organisms there should be a prohibition to import them and to trade in them except under a permit and under very stringent conditions. This should apply in particular to the pet trade;
   - where a potentially harmful organism is captive bred for commercial purposes (e.g. mink) there should be established by legislation strict standards for the design and operation of the captive breeding facilities. In particular, procedures should be established for the disposal of the stock of animals in the event of a discontinuation of the captive breeding operation;
   - there should be strict controls on the use of live fish bait to avoid inadvertent introductions of species into water where they do not naturally occur.

   Penalties

5. Deliberate introductions without a permit as well as negligence resulting in the escape or introduction of species harmful to the environment should be considered criminal offences and punished accordingly. The author of a deliberate introduction without a permit or the person responsible for an introduction by negligence should be legally liable for the damage incurred and should in particular bear the costs of eradication measures and of habitat restoration where required.

INTERNATIONAL ADMINISTRATION

Movement of Introduced Species Across International Boundaries

1. Special care should be taken to prevent introduced species from crossing the borders of a neighboring state. When such an occurence is probable, the neighboring state should be promptly warned and consultations should be held in order to take adequate measures.

   The Stockholm Declaration

2. According to Principle 21 of the Stockholm Declaration on the Human Environment, states have the responsibility 'to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states'.

   International Codes of Practice, Treaties and Agreements

3. States should be aware of the following international agreements and documents relevant to translocation of species:
   - ICES, Revised Code of Practice to Reduce the Risks from introduction of Marine Species, 1982.
   - FAO, Report of the Expert Consultation on the Genetic Resources of Fish, Recommendations to Governments No L 1980.
   - EIFAC (European Inland Fisheries Advisory Commission), Report of the Working Party on Stock Enhancement, Hamburg, FRG 1983.
   - The Bonn Convention MSC: Guidelines for Agreements under the Convention.

- The Berne Convention: the Convention on the Conservation of European wildlife and Natural Habitats.
- The ASEAN Agreement on the Conservation of Nature and Natural Resources.
- Law of the Sea Convention, article 196.
- Protocol on Protected Areas and Wild Fauna and Flora in Eastern African Region.

In addition to the international agreements and documents cited, States also should be aware of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). International shipments of endangered or threatened species listed in the Appendices to the Convention are subject to CITES regulation and permit requirements. Enquiries should be addressed to: CITES Secretariat**, Case Postale 456, CH-1219 Chatelaine, Genève, Switzerland; telephone: 41/22/979 9149, fax: 41/22/797 3417.

Regional Development Plans

4. International, regional or country development and conservation organisations, when considering international, regional or country conservation strategies or plans, should include in-depth studies of the impact and influence of introduced alien species and recommend appropriate action to ameliorate or bring to an end their negative effects.

Scientific Work Needed

5. A synthesis of current knowledge on introductions, re-introductions and re-stocking is needed.
6. Research is needed on effective, target specific, humane and socially acceptable methods of eradication and control of invasive alien species.
7. The implementation of effective action on introductions, re-introductions and re-stocking frequently requires judgements on the genetic similarity of different stocks of a species of plant or animal. More research is needed on ways of defining and classifying genetic types.
8. Research is needed on the way in which plants and animals are dispersed through the agency of man (dispersal vector analysis).

   A review is needed of the scope, content and effectiveness of existing legislation relating to introductions.

IUCN Responsibilities

International organisations, such as UNEP, UNESCO and FAO, as well as states planning to introduce, re-introduce or restock taxa in their territories, should provide sufficient funds, so that IUCN as an international independent body, can do the work set out below and accept the accompanying responsibilities.

9. IUCN will encourage collection of information on all aspects of introductions, re-introductions and restocking, but especially on the case histories of re-introductions; on habitats especially vulnerable to invasion; and notable aggressive invasive species of plants and animals.

   Such information would include information in the following categories:

   - a bibliography of the invasive species;
   - the taxonomy of the species;
   - the synecology of the species; and
   - methods of control of the species.

10. The work of the Threatened Plants Unit of IUCN defining areas of high plant endemism, diversity and ecological diversity should be encouraged so that guidance on implementing recommendations in this document may be available.
11. A list of expert advisors on control and eradication of alien species should be available through IUCN.

Note:
* The section on re-introduction of species has been enhanced by the Guidelines For Re-Introductions
** The address of the CITES Secretariat has been updated.

IUCN Policy Statement on Research Involving Species at Risk of Extinction

Approved by the 27th Meeting of IUCN Council

PROLOGUE

IUCN holds that all research on or affecting a threatened species carries a moral responsibility for the preservation or enhancement of the survival of that species. Conservation of the research resource is clearly in the interest of the researchers.

IUCN recognizes that the taking and trading of specimens of threatened species are covered by international agreements and are normally included in national legislation which provides authorized exemptions for the purpose of scientific research.

Basic and applied research is critically needed on many aspects of the biology of animal and plant species at risk of extinction (e g. those listed by IUCN as Vulnerable, Rare, Endangered, or indeterminate) to provide knowledge vital to their conservation.

Other scientific interests may involve the use of threatened species in a wide variety of studies. Taking into account the importance of many kinds of research, as well as potential threats such species could be subject to in such activities, IUCN, after careful consideration, adopts the following statements as policy.

POLICY

IUCN encourages basic and applied research on threatened species that contributes to the likelihood of survival of those species.

When a choice is available among captive-bred or propagated, wild-caught or taken, or free-living stock for research not detrimental to the survival of a threatened species, IUCN recommends the option contributing most positively to sustaining wild populations of the species.

IUCN recommends that research programs on threatened species that do not directly contribute to conservation of the species should acknowledge an obligation to the species by devoting monetary or other substantial resources to their conservation, preferably to sustaining populations in the natural environment.

Whether animals involved are captive-bred, wild-caught, or free living, or whether plants involved are propagated, taken from the wild, or in their natural habitat, IUCN opposes research that directly or indirectly impairs the survival of threatened species and urges that such research not be undertaken.

PROTOCOLS

In this context IUCN urges researchers to accept a personal obligation to satisfy themselves that the processes by which research specimens are acquired (including transportation) conform scrupulously to procedures and regulations adopted under international legal agreements. Further, researchers should adopt applicable professional standards for humane treatment of animal specimens, including their capture and use in research.

IUCN urges that any research on threatened species be conducted in conformity with all applicable laws, regulations and veterinary professional standards governing animal acquisition, health and welfare, and with all applicable agricultural and genetic resource laws and regulations governing acquisition, transport, and management of plants.

IUCN/SSC Guidelines For Re-Introductions

Prepared by the SSC Re-introduction Specialist Group *
Approved by the 41st Meeting of the IUCN Council, Gland Switzerland, May 1995

INTRODUCTION

These policy guidelines have been drafted by the Re-introduction Specialist Group of the IUCN's Species Survival Commission (1), in response to the increasing occurrence of re-introduction projects worldwide, and consequently, to the growing need for specific policy guidelines to help ensure that the re-introductions achieve their intended conservation benefit, and do not cause adverse side-effects of greater impact. Although IUCN developed a Position Statement on the Translocation of Living Organisms in 1987, more detailed guidelines were felt to be essential in providing more comprehensive coverage of the various factors involved in re-introduction exercises.

These guidelines are intended to act as a guide for procedures useful to re-introduction programs and do not represent an inflexible code of conduct. Many of the points are more relevant to re-introductions using captive-bred individuals than to translocations of wild species. Others are especially relevant to globally endangered species with limited numbers of founders. Each re-introduction proposal should be rigorously reviewed on its individual merits. It should be noted that re-introduction is always a very lengthy, complex and expensive process.

Re-introductions or translocations of species for short-term, sporting or commercial purposes - where there is no intention to establish a viable population - are a different issue and beyond the scope of these guidelines. These include fishing and hunting activities.

This document has been written to encompass the full range of plant and animal taxa and is therefore general. It will be regularly revised. Handbooks for re-introducing individual groups of animals and plants will be developed in future.

CONTEXT

The increasing number of re-introductions and translocations led to the establishment of the IUCN/SSC Species Survival Commission's Re-introduction Specialist Group. A priority of the Group has been to update IUCN's 1987 Position Statement on the Translocation of Living Organisms, in consultation with IUCN's other commissions.

It is important that the Guidelines are implemented in the context of IUCN's broader policies pertaining to biodiversity conservation and sustainable management of natural resources. The philosophy for environmental conservation and management of IUCN and other conservation bodies is stated in key documents such as "Caring for the Earth" and "Global Biodiversity Strategy" which cover the broad themes of the need for approaches with community involvement and participation in sustainable natural resource conservation, an overall enhanced quality of human life and the need to conserve and, where necessary, restore ecosystems. With regards to the latter, the re-introduction of a species is one specific instance of restoration where, in general, only this species is missing. Full restoration of an array of plant and animal species has rarely been tried to date.

Restoration of single species of plants and animals is becoming more frequent around the world. Some succeed, many fail. As this form of ecological management is increasingly common, it is a priority for the Species Survival Commission's Re-introduction Specialist Group to develop guidelines so that re-introductions are both justifiable and likely to succeed, and that the conservation world can learn from each initiative, whether successful or not. It is hoped that these Guidelines, based on extensive review of

case - histories and wide consultation across a range of disciplines will introduce more rigour into the concepts, design, feasibility and implementation of re-introductions despite the wide diversity of species and conditions involved.

Thus the priority has been to develop guidelines that are of direct, practical assistance to those planning, approving or carrying out re-introductions. The primary audience of these guidelines is, therefore, the practitioners (usually managers or scientists), rather than decision makers in governments. Guidelines directed towards the latter group would inevitably have to go into greater depth on legal and policy issues.

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1. DEFINITION OF TERMS

"Re-introduction": an attempt to establish a species(2) in an area which was once part of its historical range, but from which it has been extirpated or become extinct (3) ("Re-establishment" is a synonym, but implies that the re-introduction has been successful).

"Translocation": deliberate and mediated movement of wild individuals or populations from one part of their range to another.

"Re-inforcement/Supplementation": addition of individuals to an existing population of conspecifics.

"Conservation/Benign Introductions": an attempt to establish a species, for the purpose of conservation, outside its recorded distribution but within an appropriate habitat and eco-geographical area. This is a feasible conservation tool only when there is no remaining area left within a species' historic range.

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2. AIMS AND OBJECTIVES OF RE-INTRODUCTION

a. Aims:
The principle aim of any re-introduction should be to establish a viable, free-ranging population in the wild, of a species, subspecies or race, which has become globally or locally extinct, or extirpated, in the wild. It should be re-introduced within the species' former natural habitat and range and should require minimal long-term management.

b. Objectives:
The objectives of a re-introduction may include: to enhance the long-term survival of a species; to re-establish a keystone species (in the ecological or cultural sense) in an ecosystem; to maintain and/or restore natural biodiversity; to provide long-term economic benefits to the local and/or national economy; to promote conservation awareness; or a combination of these.

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3. MULTIDISCIPLINARY APPROACH

A re-introduction requires a multidisciplinary approach involving a team of persons drawn from a variety of backgrounds. As well as government personnel, they may include persons from governmental natural resource management agencies; non-governmental organisations; funding bodies; universities; veterinary institutions; zoos (and private animal breeders) and/or botanic gardens, with a full range of suitable expertise. Team leaders should be responsible for coordination between the various bodies and provision should be made for publicity and public education about the project.

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4. PRE-PROJECT ACTIVITIES

4a. BIOLOGICAL

(i) Feasibility study and background research

- An assessment should be made of the taxonomic status of individuals to be re-introduced. They should preferably be of the same subspecies or race as those which were extirpated, unless adequate numbers are not available. An investigation of historical information about the loss and fate of individuals from the re-introduction area, as well as molecular genetic studies, should be undertaken in case of doubt as to individuals' taxonomic status. A study of genetic variation within and between populations of this and related taxa can also be helpful. Special care is needed when the population has long been extinct.
- Detailed studies should be made of the status and biology of wild populations(if they exist) to determine the species' critical needs. For animals, this would include descriptions of habitat preferences, intraspecific variation and adaptations to local ecological conditions, social behavior, group composition, home range size, shelter and food requirements, foraging and feeding behavior, predators and diseases. For migratory species, studies should include the potential migratory areas. For plants, it would include biotic and abiotic habitat requirements, dispersal mechanisms, reproductive biology, symbiotic relationships (e.g. with mycorrhizae, pollinators), insect pests and diseases. Overall, a firm knowledge of the natural history of the species in question is crucial to the entire re-introduction scheme.
- The species, if any, that has filled the void created by the loss of the species concerned, should be determined; an understanding of the effect the re-introduced species will have on the ecosystem is important for ascertaining the success of the re-introduced population.
- The build-up of the released population should be modeled under various sets of conditions, in order to specify the optimal number and composition of individuals to be released per year and the numbers of years necessary to promote establishment of a viable population.
- A Population and Habitat Viability Analysis will aid in identifying significant environmental and population variables and assessing their potential interactions, which would guide long-term population management.

(ii) Previous Re-introductions

- Thorough research into previous re-introductions of the same or similar species and wide-ranging contacts with persons having relevant expertise should be conducted prior to and while developing re-introduction protocol.

(iii) Choice of release site and type

- Site should be within the historic range of the species. For an initial re-inforcement there should be few remnant wild individuals. For a re-introduction, there should be no remnant population to prevent disease spread, social disruption and introduction of alien genes. In some circumstances, a re-introduction or re-inforcement may have to be made into an area which is fenced or otherwise delimited, but it should be within the species' former natural habitat and range.
- A conservation/ benign introduction should be undertaken only as a last resort when no opportunities for re-introduction into the original site or range exist and only when a significant contribution to the conservation of the species will result.
- The re-introduction area should have assured, long-term protection (whether formal or otherwise).

(iv) Evaluation of re-introduction site

- Availability of suitable habitat: re-introductions should only take place where the habitat and landscape requirements of the species are satisfied, and likely to be sustained for the for-seeable future. The possibility of natural habitat change since extirpation must be considered. Likewise, a change in the legal/ political or cultural environment since species extirpation needs to be ascertained and evaluated as a possible constraint. The area should have sufficient carrying capacity to sustain growth of the re-introduced population and support a viable (self-sustaining) population in the long run.
- Identification and elimination, or reduction to a sufficient level, of previous causes of decline: could include disease; over-hunting; over-collection; pollution; poisoning; competition with or predation by introduced species; habitat loss; adverse effects of earlier research or management programs; competition with domestic livestock, which may be seasonal. Where the release site has undergone substantial degradation caused by human activity, a habitat restoration program should be initiated before the re-introduction is carried out.

(v) Availability of suitable release stock

- It is desirable that source animals come from wild populations. If there is a choice of wild populations to supply founder stock for translocation, the source population should ideally be closely related genetically to the original native stock and show similar ecological characteristics (morphology, physiology, behavior, habitat preference) to the original sub-population.
- Removal of individuals for re-introduction must not endanger the captive stock population or the wild source population. Stock must be guaranteed available on a regular and predictable basis, meeting specifications of the project protocol.
- Individuals should only be removed from a wild population after the effects of translocation on the donor population have been assessed, and after it is guaranteed that these effects will not be negative.
- If captive or artificially propagated stock is to be used, it must be from a population which has been soundly managed both demographically and genetically, according to the principles of contemporary conservation biology.
- Re-introductions should not be carried out merely because captive stocks exist, nor solely as a means of disposing of surplus stock.
- Prospective release stock, including stock that is a gift between governments, must be subjected to a thorough veterinary screening process before shipment from original source. Any animals found to be infected or which test positive for non-endemic or contagious pathogens with a potential impact on population levels, must be removed from the consignment, and the uninfected, negative remainder must be placed in strict quarantine for a suitable period before retest. If clear after retesting, the animals may be placed for shipment.
- Since infection with serious disease can be acquired during shipment, especially if this is intercontinental, great care must be taken to minimize this risk.
- Stock must meet all health regulations prescribed by the veterinary authorities of the recipient country and adequate provisions must be made for quarantine if necessary.

(vi) Release of captive stock

- Most species of mammal and birds rely heavily on individual experience and learning as juveniles for their survival; they should be given the opportunity to acquire the necessary information to

enable survival in the wild, through training in their captive environment; a captive bred individual's probability of survival should approximate that of a wild counterpart.

- Care should be taken to ensure that potentially dangerous captive bred animals (such as large carnivores or primates) are not so confident in the presence of humans that they might be a danger to local inhabitants and/or their livestock.

4b. SOCIO-ECONOMIC AND LEGAL REQUIREMENTS

- Re-introductions are generally long-term projects that require the commitment of long-term financial and political support.
- Socio-economic studies should be made to assess impacts, costs and benefits of the re-introduction program to local human populations.
- A thorough assessment of attitudes of local people to the proposed project is necessary to ensure long term protection of the re-introduced population, especially if the cause of species' decline was due to human factors (e.g. over-hunting, over-collection, loss or alteration of habitat). The program should be fully understood, accepted and supported by local communities.
- Where the security of the re-introduced population is at risk from human activities, measures should be taken to minimize these in the re-introduction area. If these measures are inadequate, the re-introduction should be abandoned or alternative release areas sought.
- The policy of the country to re-introductions and to the species concerned should be assessed. This might include checking existing provincial, national and international legislation and regulations, and provision of new measures and required permits as necessary.
- Re-introduction must take place with the full permission and involvement of all relevant government agencies of the recipient or host country. This is particularly important in re-introductions in border areas, or involving more than one state or when a re-introduced population can expand into other states, provinces or territories.
- If the species poses potential risk to life or property, these risks should be minimized and adequate provision made for compensation where necessary; where all other solutions fail, removal or destruction of the released individual should be considered. In the case of migratory/mobile species, provisions should be made for crossing of international/state boundaries.

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5. PLANNING, PREPARATION AND RELEASE STAGES

- Approval of relevant government agencies and land owners, and coordination with national and international conservation organizations.
- Construction of a multidisciplinary team with access to expert technical advice for all phases of the program.
- Identification of short- and long-term success indicators and prediction of program duration, in context of agreed aims and objectives.
- Securing adequate funding for all program phases.
- Design of pre- and post- release monitoring program so that each re-introduction is a carefully designed experiment, with the capability to test methodology with scientifically collected data.

Monitoring the health of individuals, as well as the survival, is important; intervention may be necessary if the situation proves unforseeably favorable.

- Appropriate health and genetic screening of release stock, including stock that is a gift between governments. Health screening of closely related species in the re-introduction area.
- If release stock is wild-caught, care must be taken to ensure that: a) the stock is free from infectious or contagious pathogens and parasites before shipment and b) the stock will not be exposed to vectors of disease agents which may be present at the release site (and absent at the source site) and to which it may have no acquired immunity.
- If vaccination prior to release, against local endemic or epidemic diseases of wild stock or domestic livestock at the release site, is deemed appropriate, this must be carried out during the "Preparation Stage" so as to allow sufficient time for the development of the required immunity.
- Appropriate veterinary or horticultural measures as required to ensure health of released stock throughout the program. This is to include adequate quarantine arrangements, especially where founder stock travels far or crosses international boundaries to the release site.
- Development of transport plans for delivery of stock to the country and site of re-introduction, with special emphasis on ways to minimize stress on the individuals during transport.
- Determination of release strategy (acclimatization of release stock to release area; behavioural training - including hunting and feeding; group composition, number, release patterns and techniques; timing).
- Establishment of policies on interventions (see below).
- Development of conservation education for long-term support; professional training of individuals involved in the long-term program; public relations through the mass media and in local community; involvement where possible of local people in the program.
- The welfare of animals for release is of paramount concern through all these stages.

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6. POST-RELEASE ACTIVITIES

- Post release monitoring is required of all (or sample of) individuals. This most vital aspect may be by direct (e.g. tagging, telemetry) or indirect (e.g. spoor, informants) methods as suitable.
- Demographic, ecological and behavioral studies of released stock must be undertaken.
- Study of processes of long-term adaptation by individuals and the population.
- Collection and investigation of mortalities.
- Interventions (e.g. supplemental feeding; veterinary aid; horticultural aid) when necessary.
- Decisions for revision, rescheduling, or discontinuation of program where necessary.
- Habitat protection or restoration to continue where necessary.
- Continuing public relations activities, including education and mass media coverage.
- Evaluation of cost-effectiveness and success of re- introduction techniques.
- Regular publications in scientific and popular literature.

Footnotes:

1. Guidelines for determining procedures for disposal of species confiscated in trade are being developed separately by IUCN.
2. The taxonomic unit referred to throughout the document is species; it may be a lower taxonomic unit (e.g. subspecies or race) as long as it can be unambiguously defined.
3 . A taxon is extinct when there is no reasonable doubt that the last individual has died

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The IUCN/SSC Re-introduction Specialist Group

The IUCN/SSC Re-introduction Specialist Group (RSG) is a disciplinary group (as opposed to most SSC Specialist Groups which deal with single taxonomic groups), covering a wide range of plant and animal species. The RSG has an extensive international network, a re-introduction projects database and re-introduction library. The RSG publishes a bi-annual newsletter RE-INTRODUCTION NEWS.

If you are a re-introduction practitioner or interested in re-introductions please contact:

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