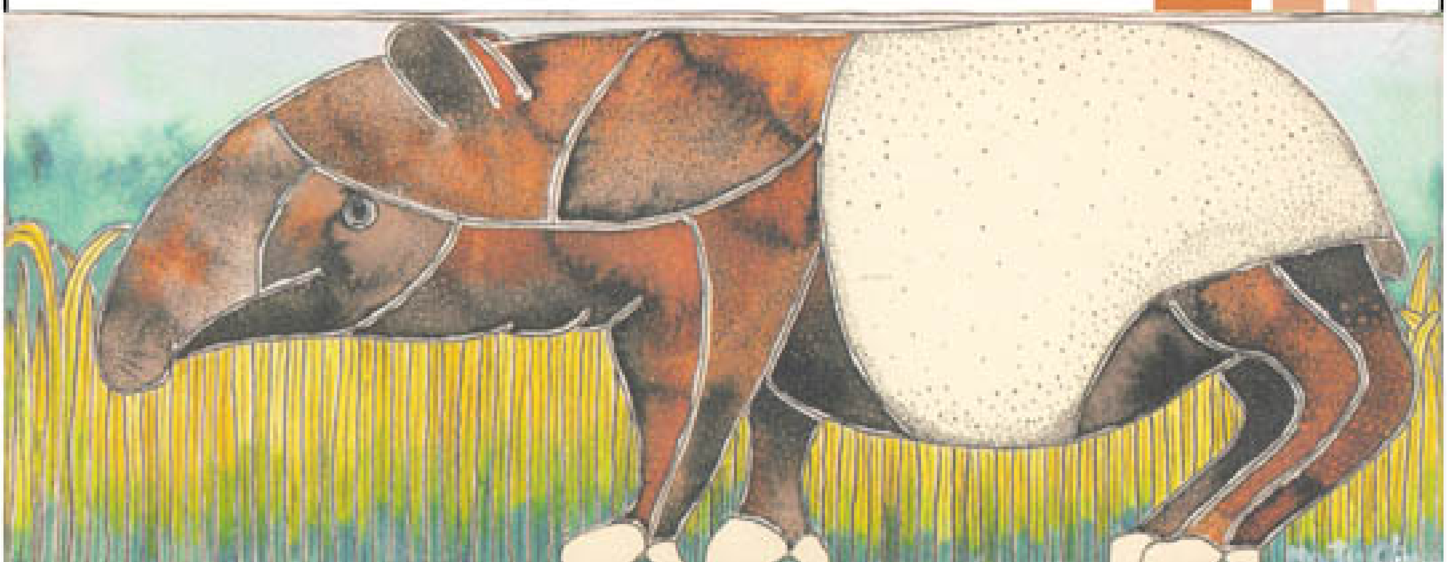
Malay Tapir (*Tapirus indicus*)

Conservation Workshop



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

Malay Tapir Conservation Workshop

12 – 16 August 2003

National Biology Conservation Training Center
Krau Wildlife Reserve, Malaysia

FINAL WORKSHOP REPORT

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).

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Malay Tapir Conservation Workshop

National Biology Conservation Training Center
Krau Wildlife Reserve, Malaysia

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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:

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Kae Kawanishi	Division of Research and Conservation, Department of Wildlife and National Parks, Malaysia
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Wilson Novarino	Lecturer, Dept. Biology FMIPA, Andalas University, Indonesia
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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
<u>To promote better cooperation and coordination activities</u>

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
<u>To ease access to relevant and related accessory data</u>

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
<u>To develop clear and unambiguous standards and protocols for data publication including proper acknowledgement of sources</u>

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
<u>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</u>

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*:**

Charles R. Foerster	Project Leader, Baird's Tapir Project, Corcovado National Park, Costa Rica
Listya Kusumarwardhani	Director, Kerinci Seblat National Park, Indonesia
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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.

<u>Results II: General Risk Analysis</u>

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.

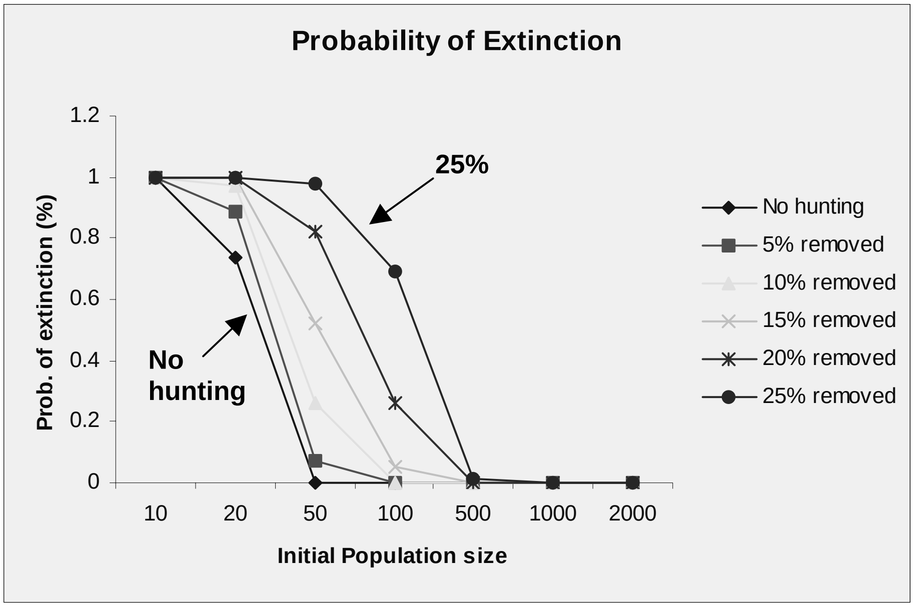


Figure 1. Malay tapir population viability analysis: Impact of hunting on 100-year extinction risk. All models initialized with baseline demographic values, with hunting pressure imposed as additional mortality risk. See text for additional details.

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.**

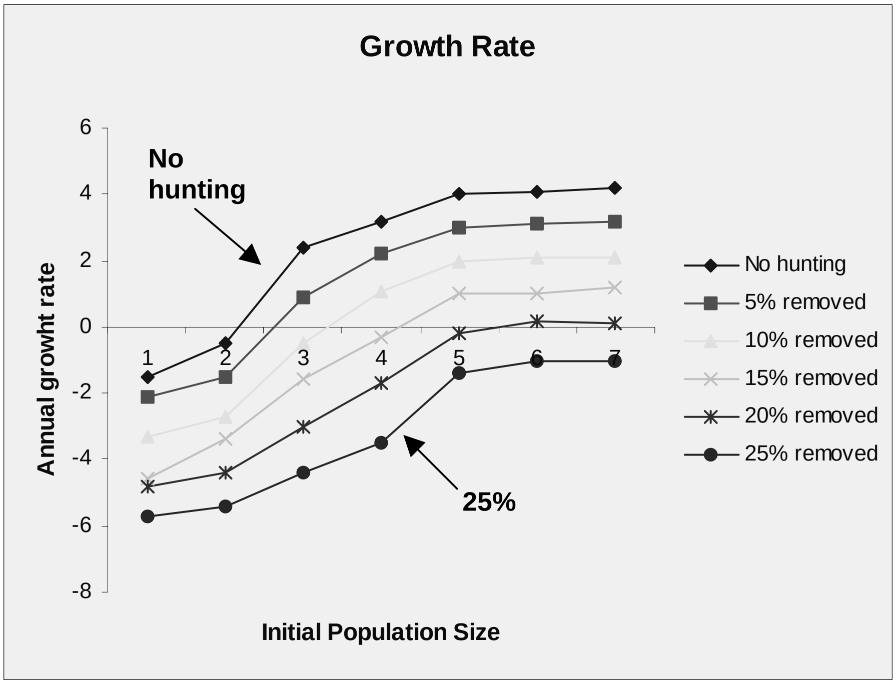


Figure 2. Malay tapir population viability analysis: Impact of hunting on stochastic population growth rate. X–axis labels 1 – 7 indicate variable initial population sizes as described in Figure 1. See text for additional details.

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.**

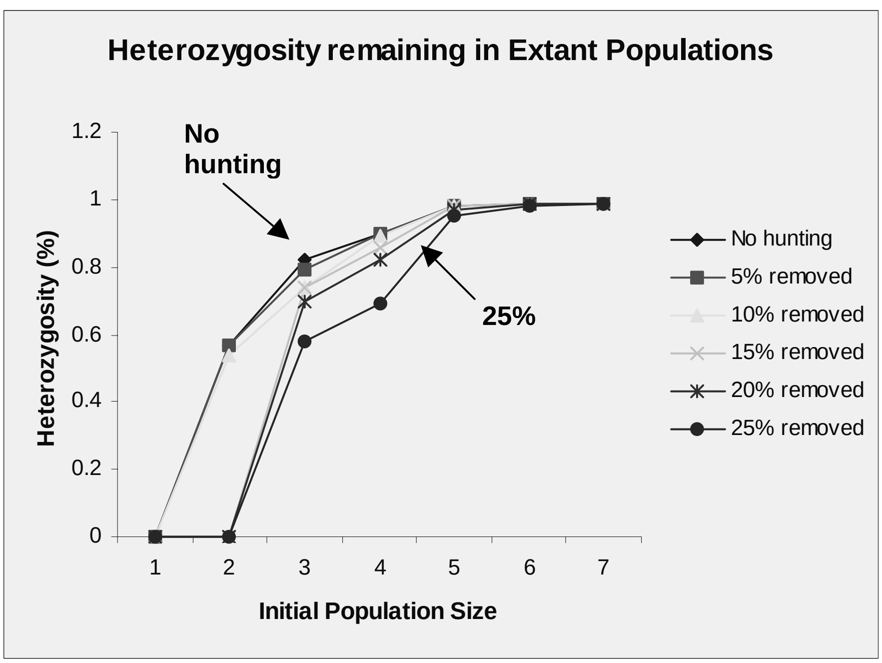


Figure 3. Malay tapir population viability analysis: Impact of hunting on retention of population heterozygosity. X–axis labels 1 – 7 indicate variable initial population size as described in Figure 1. See text for additional details.

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 km^2	$N_0 = K = 210$	density 0.4
	K 34 km^2/year	$N_0 = K = 420$	density 0.8
	16 years = 0	$N_0 = K = 11$	density 0.02
c.)	Lowland forest = 928 km^2	$N_0 = K = 371$	density 0.4
	K 25 km^2/year	$N_0 = K = 742$	density 0.8
	37 years = 0	$N_0 = K = 19$	density 0.02
d.)	Total forest = 1,209 km^2	$N_0 = K = 484$	density 0.4
	K 46 km^2/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.

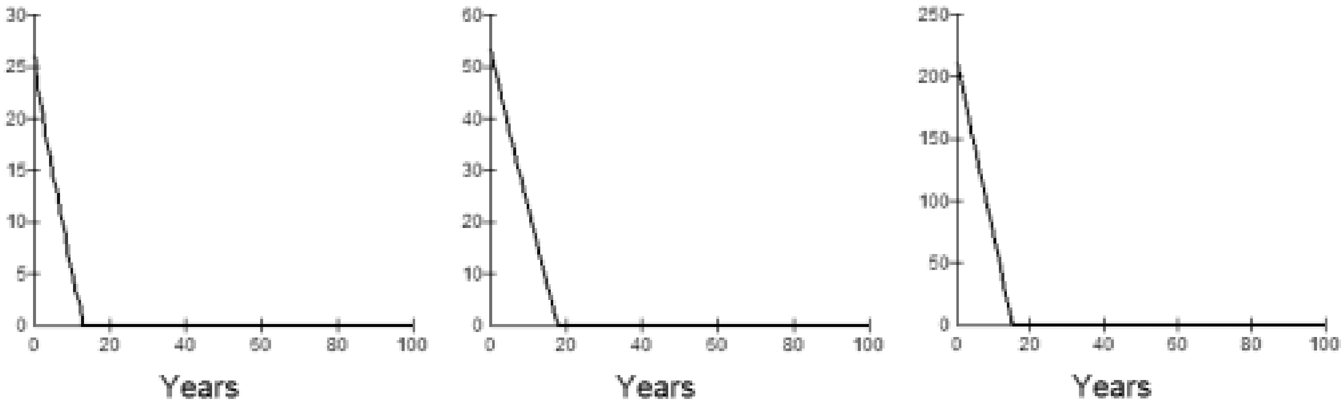
Table 2. Number of tapirs in Bukit Barisan Selatan National Park, Sumatra based on current estimates of habitat availability and historical rates of forest loss. See text for explanation and sources of values.

		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)

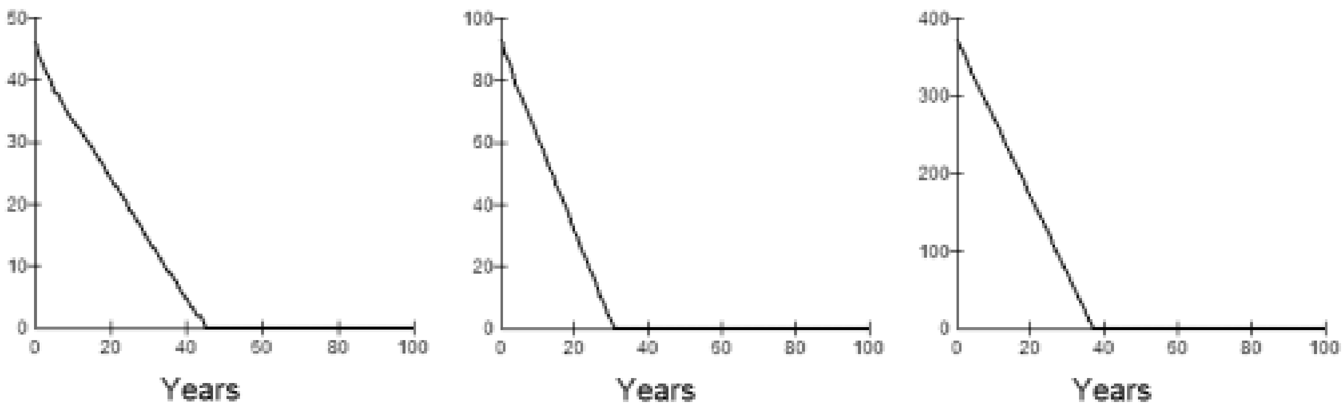
As Kinnaird *et al.* (2003) state, no forests will be left in BBS for wildlife to survive if the current rates of forest loss continue for the next 50 years. It is not surprising, therefore, that none of the simulations produced a population surviving until the last forest patches were lost. The simulated 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.

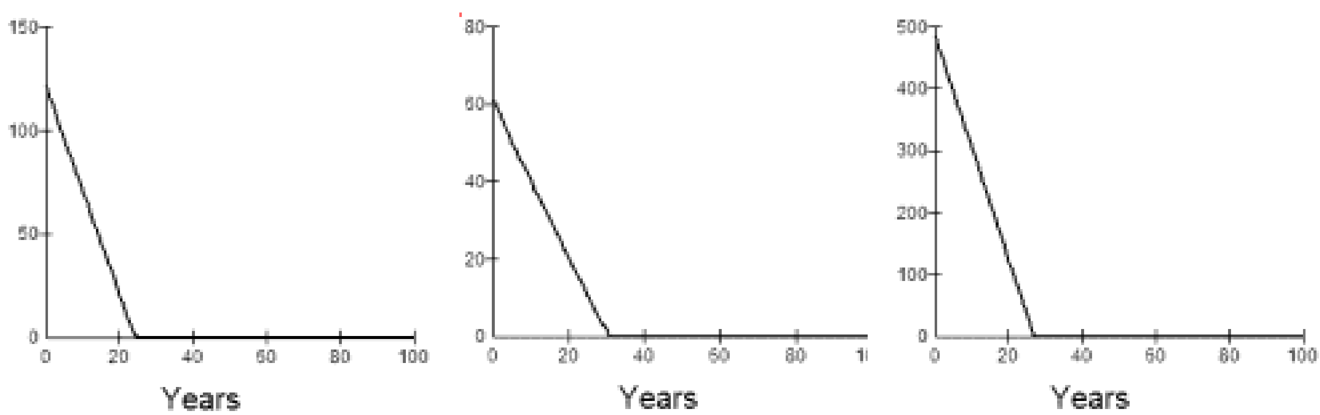
A. Tiger / Rhino habitat: 525 km^2; Habitat loss rate: 34 km^2/year



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. <u>Regardless of the present numbers of tapirs in Sumatra, current deforestation rates will clearly ensure extinction within 50 years or less</u>.**

Goals and Recommended Actions

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

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

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.

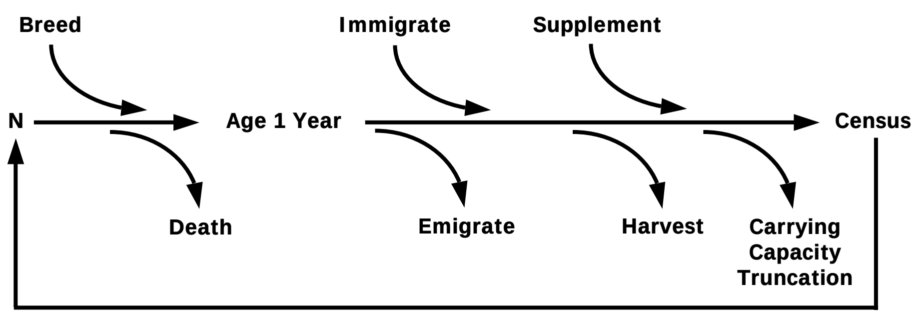
Although computer simulation models can be complex and confusing, they are precisely defined and all the assumptions and algorithms can be examined. Therefore, the models are objective, testable, and open to challenge and improvement. PVA models allow use of all available data on the biology of the taxon, 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:
<u>Deterministic r</u> -- 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.

<u>Stochastic r</u> -- 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.

<u>P(E)</u> -- 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.

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

<u>SD(N)</u> -- 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.

<u>H</u> -- 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

***Working Group Participants*:**

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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

Forest Conversion to Cultivation

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).

Logging Activity

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:

Dionysius S. K. Sharma	National Program Director, Worldwide Fund for Nature (WWF) Malaysia
N. S. Vellayan	Acting Zoo Director / Head Veterinarian / Assistant Director, National Zoo of Malaysia (Zoo Negara)
Ramlah Abdul Majid	Research, Headquarters, Department of Wildlife and National Parks, Malaysia
Abd. Kadir Hashim	Division of Research and Conservation, Department of Wildlife and National Parks, Malaysia
Wan Shaharuddin Wan Nordin	Division of Research and Conservation, Department of Wildlife and National Parks, Malaysia
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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
Krau Wildlife Reserve, Malaysia

Section 7
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Section 8
Acronym Glossary

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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 Policy Statements can be found on the internet at:

http://www.iucn.org/themes/ssc/pubs/policy/index.htm