



SPECIES SURVIVAL COMMISSION

Thamin (*Cervus eldi thamin*) POPULATION & HABITAT VIABILITY ASSESSMENT

**FINAL
REPORT**

Yangon, Myanmar
24-28 January 2000

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A Collaborative Workshop

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CONSERVATION & RESEARCH CENTER, SMITHSONIAN INSTITUTION
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SECTION 1

WORKSHOPS INTRODUCTION AND OVERVIEW

Thamin (*Cervus eldi thamin*) Population & Habitat Viability Assessment: Introduction and Overview

Introduction

The Eld's deer (*Cervus eldi eldi*) was first discovered in 1838 in the Manipur Valley of India by a British army officer, Lieutenant Percy Eld. Three subspecies are recognized as occurring in India, Myanmar and Indo-China (Whitehead, 1972). During the 20th century, the once widespread species disappeared throughout most of its range (Figure 1 from McShea et al., 1999).

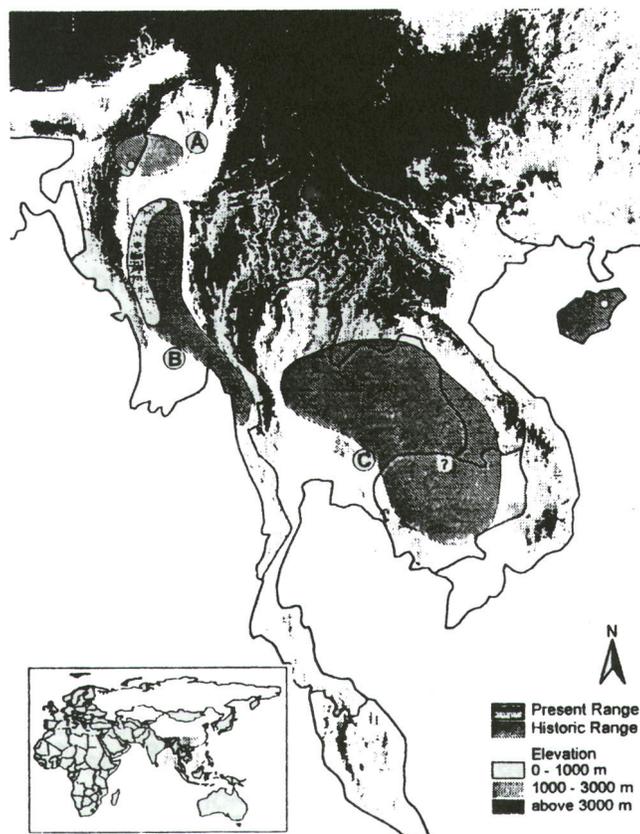


Figure 1. Historical and present range of *Cervus eldi* in southeast Asia. Historical range is indicated by diagonal stripes. The present range, indicated by stippling includes two semi-captive populations in India and Hainan Island, and a postulated population in northern Cambodia (see McShea et al., 1999).

By 1945, Eld's deer were described as rare or endangered throughout most of the southern portions of their range (Harper, 1945). In Myanmar, populations of *Cervus eldi thamin* were considered common throughout the 1940s and their distribution was described as patchy but abundant in 1967 and 1986 (Tun Yin, 1967; Salter and Sayer, 1986). The subspecies now is protected in Myanmar (Forest Department, 1936, 1994; Wemmer, 1998).

Thamin are grazers and opportunistic browsers that supplement their diet with wild fruit and cultivated crops, particularly rice (Lekagul and McNeely, 1977). Current evidence suggests that few pristine thamin habitats remain, and populations have been reported to occupy habitats ranging from dry scrub and thorn forest to open deciduous forest (Salter and Sayer, 1986; Wemmer, 1987).

Myanmar has one of the highest proportions of forest cover in the Asia-Pacific region (UNEP, 1995). Based on NOAA AVHRR satellite data, the estimated cover of closed forest in Myanmar is approximately 29.33 million ha (43.3%). In 1990, Myanmar was approximately 50-58% forested, with some 14% covered with some form of deciduous forest (UNEP, 1995; Achard and Estreguil, 1995). Although this forest cover, in general, is extensive, there may be significant losses of deciduous forest types. Overall deforestation rates in Myanmar were estimated at one-third that of Thailand from 1980-1991 (Achard and Estreguil, 1995).

Whitehead (1972) estimated the thamin population in Myanmar to be 4,000 animals in the 1970s, but the first countrywide questionnaire distributed by the Wildlife Department in 1992 estimated that only 2,200 deer remained within the country, with the largest population (>1,200 deer) in the Chatthin Wildlife Sanctuary (Myint Aung, 1994). Chatthin Wildlife Sanctuary (CWS) is comprised of secondary indaing (deciduous dipterocarp) forest and mixed deciduous forest, and originally was established as a fuel reserve forest in 1941. Sight surveys for thamin along 65 km line transects initially were conducted at CWS in 1982 (Salter and Sayer, 1986) and were repeated annually from 1992 to 1996 by the Myanmar Wildlife Department (Table 1).

Table 1. Annual estimates of thamin abundance within Chatthin Wildlife Sanctuary based on line transect surveys conducted during the first week of April.
(from McShea et al., 1999)

	1983	1991	1992	1993	1994	1995	1996
Kilometers walked	81	94	76	73	81	174	87
Animals sighted	147	187	89	72	80	137	111
Density (deer/ km ²)	8.3	9.3	7.8	4.7	4.8	4.1	4.7

These surveys indicated a 40% decline in thamin abundance since 1983. In 1997, McShea et al. (1999) conducted a survey of 24 of 28 townships in Myanmar that had

been reported to contain thamin in 1992. Results indicated that there were 20 fragmented populations of thamin remaining, with evidence of thamin found in 23 townships, primarily in mixed deciduous forests where dipterocarp trees were present. McShea and colleagues digitized maps of forest transects containing thamin and conducted landscape analyses on a resampled habitat map that emphasized dry and dipterocarp deciduous forest. Survey and mapping showed that:

- 9,166 km² of dry forest were found in 254 patches
- 9,532 km² of indaing were found in 120 patches (with no thamin present)
- thamin habitat patches typically have large areas – none of the 92 unsurveyed patches were likely suitable for thamin.

McShea and colleagues concluded that thamin can only survive in the larger patches of habitat (indaing or dry forest) large enough to escape the impact of villages on the forests. Of six landscape variables measured, only core area size was a significant predictor for the presence of thamin: there were no cases of populations of thamin in forest areas less than 100 km² in size (McShea et al., 1999).

Disturbance by humans seems to be the most important force contributing to the decline of thamin populations. The largest reservoir of thamin resides in Chatthin Wildlife Sanctuary. However, there are about 19 villages surrounding the Sanctuary and three villages contained within the sanctuary boundaries (Myint Aung, pers. comm.). Populations in all the villages are increasing at a rate of approximately 3% per year (Myint Aung, pers. comm.). Combined, the three villages within CWS contain 269 households consisting of 724 individuals (Myint Aung, pers. comm.); the largest has about 500 people.

Villages within the CWS use Sanctuary land for agriculture and cattle grazing, which has eroded the habitat. There also is a great deal of fuel wood consumption; villagers cut trees and saplings which contributes to habitat degradation within the Sanctuary. Although indaing and dry forests persist around the edge of CWS, farmers have tended to slowly push into prime habitat and remaining forest in the buffer zone around the Sanctuary is at risk. As with domestic cattle, thamin are primarily grazers (Lekagul and McNeely, 1977), and may depend on the pulse in grass productivity generated by seasonal fires in intact indaing forests.

Five villages use the buffer zone areas surrounding CWS. The three villages within CWS graze their cattle within the core area of the Sanctuary, and nine villages graze cattle on fringe areas that encroach on CWS boundaries. In total, between 2,000 and 3,000 cattle graze these areas from November to February and from May to June. While the cattle may compete for resources with 800 or more thamin that inhabit CWS, the total grazed area encompasses approximately 2,650 acres out of a total 66,500 acres (4%). Peak grazing occurs from November to February, which is a critical period in the life history cycle of the thamin: females are lactating and males are preparing for the rut during this time. This competition for grazing resources may be a problem that negatively impacts thamin.

The Thamin PHVA Workshop

To address the concerns outlined above, as well as other problems facing the thamin in Myanmar, a Population and Habitat Viability Assessment (PHVA) workshop was held at The Central Forestry Development Training Center at Hmawbi, Myanmar from 24-27 January 2000. The workshop was conducted at the invitation of the Myanmar Ministry of Forestry, Nature and Wildlife Conservation Division, Forest Department, and was organized jointly with the Conservation & Research Center, Smithsonian Institution in Front Royal, Virginia (USA). Forty people attended the workshop (Appendix I), which was hosted by the Myanmar Ministry of Forestry, Nature and Wildlife Conservation Division, Forest Department, the Smithsonian Institution and was facilitated by the Conservation Breeding Specialist Group (CBSG) of the IUCN Species Survival Commission. Participants included Myanmar biologists, researchers, park wardens, wildlife managers, and other experts. The Conservation & Research Center, Smithsonian Institution, generously supported the workshop. The primary aim of the PHVA was to develop a first-cut conservation action plan to improve the status of thamin in Myanmar, particularly within the Chatthin Wildlife Sanctuary.

The PHVA Process

At the beginning of each PHVA workshop, participants agree that the general desired outcome is to prevent the extinction of the species and to maintain a viable population(s) in nature. The workshop process takes an in-depth look at the species' life history, population history, status, and dynamics, and assesses the threats and current conditions putting the species at risk.

One by-product of PHVA workshops is a compilation of a large body of information that may not previously have been published. This information usually arises from many sources, including people with expert knowledge, as well as a stake in the future of the species. Information contributed by park wardens, scientists, field biologists, private landowners and others all carry equal importance.

To obtain the most comprehensive picture regarding a species, workshop participants discuss all information that can be gathered. The goal is to reach agreement on the state of current baseline information. These data then are incorporated into a computer simulation model to determine: (1) risk of local extinction under current conditions; (2) those factors that make the species vulnerable to extinction; and (3) which factors, if changed or manipulated, may have the greatest effect on preventing local extinction. In essence, these computer-modeling activities provide an objective way to examine the current situation and assess the factors that might be changed to prevent local extinction.

Complimentary to the modeling process is a deliberation process that takes place throughout the workshop. Participants work together to identify the key issues affecting the conservation of the species and then work in small groups to discuss these issues. These can range from predator management to disease to human-animal interactions,

or other emerging topics. Each working group produces a brief report on their topic, which is included in the final document. In a successful PHVA workshop, participants with different perspectives, interests and needs agree on major conclusions and recommendations. Local solutions take priority. Local participants develop and own workshop report recommendations.

Process for the Present Workshop

At the beginning of the Thamin PHVA workshop, the 40 participants worked together to identify the major issues and concerns affecting the conservation of the thamin (Table 2). Five main topics then became the focus of five topic-based working groups: Population Biology and Modeling, Threats to Thamin, Buffer Zone Creation, Infrastructure, and Public and Policy-Makers' Awareness.

Each working group was asked to:

- Examine the list of problems and issues affecting the conservation of the species in each working group topic, and if needed expand upon the list.
- Identify, amplify, and prioritize the most important issues.
- Develop, elaborate, and prioritize between three and five priority solutions that hold promise in addressing the key issues.
- Amplify and specify action steps needed to implement the solutions including, if possible, time lines and people needed to assist in implementation.
- Identify priority projects emerging from the working group's recommendations.

Each group presented the results of their work in daily plenary sessions. This ensured that everyone had an opportunity to hear and contribute to the work of the other groups, and allowed each group's work to be reviewed and discussed by all workshop participants. Recommendations contained in this workshop report were accepted by all participants, thus a consensus was reached. Working group reports can be found in Section 2 of this document.

Summary of Working Group Report Recommendations

POPULATION BIOLOGY AND POPULATION VIABILITY MODELING WORKING GROUP

The models developed by this group showed the need for immediate action to stem the decline in the thamin population. These models showed that the probability of extinction of the thamin population does not decline to a tolerable level (below 10%) until virtually all the human-related threats have been removed. This means that poaching must be reduced from 40/year to 5 to 10/year, with risk of disease from livestock reduced to 1 or 2%, and the sanctuary must be managed under a plan of long-term stability. To address these problems, the group recommended that:

1. The most severe threat to the thamin population is the use of the Chatthin Wildlife Sanctuary by humans, their livestock and domestic animals. The most substantial threat-reducing action would be to remove villagers or reduce the direct impact on the core area of the sanctuary. This includes removal of cattle from the reserve (to reduce disease potential).
2. Annual surveys on all habitat types (core and degraded) should be continued to monitor density of thamin in the sanctuary. Surveys should provide total population size estimates with a specific level of precision of $\pm 20\%$.
3. Human use of the core and degraded areas should be monitored annually, using survey techniques that detect changes in the pattern and frequency of human use of these areas.
4. While the conservation and management of thamin in CWS should be of the highest priority, depending solely on the CWS as the only reservoir for this species is too risky given the severity of the risks facing that population. Establishing and maintaining additional populations of thamin should be explored. This should include populations in other reserves as well as populations in zoos around the world.
5. Zoo populations should continue to be managed as a genetic and demographic backup to the CWS population in the event of the extinction of that population. If the CWS population goes extinct, these populations could be used to reestablish a population in CWS, if and when appropriate.
6. Training of staff in wildlife management techniques should continue. Training should include basic wildlife management and environmental education (as detailed in other groups). Basic and applied research of all kinds should be encouraged in the reserve.
7. Knowledge of pre-adult and adult mortality rates and the proportion of females breeding is vital to determining the viability and predicting the continuation of the population. Radio-tracking studies (of at least 20 deer) can assist in providing estimates of these rates as well as identifying primary causes of mortality. Population viability should be continuously assessed as data are accumulated, and appropriate staff should be trained in methods of population viability analysis.

THREATS TO THAMIN WORKING GROUP

The group identified five primary threats to thamin populations: habitat loss, poaching, human disturbance, pollution and infectious disease from livestock (foot and mouth disease, anthrax, etc.).

Habitat loss

Degradation or conversion of habitat results in land being unsuitable for sustaining thamin. In Myanmar, land has been converted for agricultural uses, resulting in increased numbers of villages on the boundary or within suitable thamin habitats

Increased demand for forest products (fuel wood, thatch, rocks and minerals) has led to deforestation or degraded habitat, in turn causing diminished numbers of thamin. For example, in 1963, more than 78 townships had thamin, but by 1997, fewer than 20 still had thamin present.

These problems were discussed in the context of Chatthin Wildlife Sanctuary (CWS). There are currently 19 villages surrounding CWS, and three inside the Sanctuary. If existing villages within the CWS are permitted to continue to grow (at >3% per year), then agriculture, deforestation, poaching and cattle grazing will destroy the small amount of thamin habitat (Indaing forest) that now remains. The group therefore recommended that the Myanmar government consider reviewing the idea of relocating the Kyein, Singaung and Sacthachang villages outside of CWS, according to plans originally proposed by the chief commander of the Northwest command in 1996.

The suggested solution to move the three villages currently within Chatthin Wildlife Sanctuary led to a great deal of discussion when presented in plenary session. A separate working group, "Resettlement of Villages," comprised of members from both the Threats to Thamin Working Group and the Buffer Zone Working Group, was convened to briefly discuss this issue on the third day of the workshop. This was a preliminary discussion and it is possible that important components may have been overlooked or are otherwise missing. However, for the purposes of this workshop and report, it was believed that a preliminary discussion among the participants was important.

The group began by agreeing that:

1. The three villages currently within CWS have a negative impact on the thamin population in the sanctuary and that relocation of these villages out of the sanctuary might be one possible way of reducing pressures on thamin population.
2. Based on underlying assumptions built into the VORTEX model (see Modeling Group Report), current village growth rates (3% per year) of these three villages, as well as the other villages surrounding the CWS, will lead to the extinction of the thamin population within 100 years.
3. There is a window of time (initial simulations from the VORTEX model indicates at least 15 years, however, further modeling indicated that this would occur within 6 years) before the 3% village growth rate poses a serious risk of extinction to thamin.
4. People and thamin must be considered together, not as separate entities.
5. It is most likely that villagers do not wish to be relocated, but if villages are removed and good facilities and situations are provided, then social problems will be less serious. An independent study of experience in relocation in Myanmar and other countries should be conducted before any action is taken, as any removal will serve as a model for Myanmar.
6. Disease transmission from cattle to thamin is a serious threat.

The group discussed the two possible scenarios:

1. **What would need to be considered or provided if villages were moved?**
2. **What would need to be done/be changed if the villages remain in the Sanctuary?**

SCENARIO 1. WHAT WOULD NEED TO BE CONSIDERED OR PROVIDED IF VILLAGES WERE MOVED?**Solutions/considerations:**

1. Involve local NGOs (e.g. FREDAs), local government and villagers in discussions about relocation to provide a basis for decisions before they are made. A neutral mediator who speaks the local language and has a good understanding of local culture and government should conduct discussions.
2. Considerations for the new location included:
 - a) New homes should be constructed according to villagers' wishes, with most materials to be provided by the government.
 - b) Provision of substantial financial compensation (e.g. 12 months income per family) should be considered, which would depend on the funding source for the resettlement. Other models also should be considered (e.g., provision of low or no-interest loans from a revolving fund to help villagers develop new livelihoods or sources of income).
 - c) Land and long-term training in agricultural techniques should be provided so that people can successfully farm land in the new location.
 - d) Maintain social and cultural integrity as much as possible (e.g., move monasteries and/or other important buildings or structures or parts thereof, to the new site)
 - e) Organize moving of personal belongings to homes, including livestock.
 - f) Provide a choice of three or four sites for relocation so that people can choose the location of their new home.

SCENARIO 2. WHAT WOULD NEED TO BE DONE/BE CHANGED IF THE VILLAGES REMAIN IN THE SANCTUARY?**Solutions/considerations:**

1. Introduce family planning and adequate health care facilities (families presently have 4-12 children but mortality is high).
2. Explore options for removal of cattle from grazing inside Sanctuary: assess how many cattle each family really needs and explore alternatives to cattle grazing inside the Sanctuary.
3. Consider a moratorium on new house construction and other development in villages; consider disallowing homes within Protected Areas to be passed on to offspring, with concomitant provision of incentives to encourage villagers to leave gradually.

4. The Department of Wildlife Conservation should consider developing a management plan, in collaboration with village representatives, to control village activities to sustainable levels of land use within prescribed zones (buffer zones). This management planning process needs to be independently facilitated, with substantial and meaningful input from the villages at every step. (See Buffer Zone Working Group report for further details.)
5. Strengthen and develop an education program for villagers of all ages, with special nature conservation and language components for children.
6. Develop a system of rewards for people to assist in anti-poaching activities.
7. Dogs should no longer be allowed in villages.
8. Explore idea of alternative fuels, re-forestation projects or planting fuel wood plantations for villagers' use.
9. At all stages, continue to pursue further dialogue with villagers to help identify other ideas/projects.

STEPS FOR POSSIBLE IMPLEMENTATION INCLUDED:

1. As a first step, provide villagers with the option of either being resettled or developing and implementing a management plan to enable them to remain living within the Sanctuary.
2. Develop a management plan in accordance with provisions in #4 above within 2 years. **The Management plan should include criteria by which effectiveness of implementation will be assessed after a certain period of time (e.g., 3-5 years).** (Note: where possible, and in agreement with villagers, commence implementation of components as soon as practicable.)
3. Implement management and regularly (annually) evaluate and modify/develop management, in continual consultation with stakeholders (villagers, Department of Wildlife Conservation, etc.), as appropriate (i.e., adaptive management).
4. An independent evaluation team should evaluate the effectiveness of implementation after five years based on previously agreed criteria (#2 above).
5. Based on the results of the independent evaluation, decide whether to continue with management plan or resettle villagers.
6. This entire process (including resettlement if decided) needs to be completed within 10 years, **and preferably much sooner**, given the rate of habitat loss defined by the population viability modeling group.

[Note: several individuals submitted comments concerning this controversial issue after the workshop, emphasizing that the ultimate responsibility to protect

CWS lies with the government of Myanmar. CWS was designated as a fuel reserve for people before it was declared a Sanctuary. In light of this, if the decision were made to move the villages, then socioeconomic issues for villagers who lived in the park before its establishment should be of equal importance to thamin conservation. Villagers would need to be provided with facilities to meet their satisfaction. If villages are not moved, then immediate actions to allow people and thamin to live together in CWS, without harm to the thamin population (e.g., immediate moratorium on forest clearing) are essential. A third alternative not discussed in this workshop was the possibility of moving thamin to another protected area. Regardless of the final decision, the needs of all involved parties, including the thamin, need to be considered.]

Poaching

Thamin are hunted for their meat and antlers throughout their range in Myanmar. Hunting methods include spotlighting (at night) and the use of firearms, spears and snares. Poaching of thamin is considered a major threat to the CWS population. Most poaching is believed to be undertaken by villagers living within CWS, and some poachers also come from villages surrounding the CWS. Staff estimates that there are two hunting parties (attempts) per month totaling 24 per year, with a total of 30-40 deer poached per year.

Solutions:

1. Confiscate all firearms given to village military teams by township authorities (Kawlin township only). Request special cooperation from the Division Peace and Development Council to restrict distribution of firearms.
2. Enforce existing laws prohibiting poaching.
3. Increase efficiency of CWS staff anti-poaching patrols.

Human Disturbance

Specific to Chatthin Wildlife Sanctuary:

Local people collect forest products, including leaves, mushrooms, truffles, thatch grass, fuel wood and building materials. Thus, local peoples may spend considerable time within the sanctuary boundaries, which may disturb thamin. Humans often start fires within CWS, which may disturb portions of the animals' life history patterns.

Solutions:

1. Enforce existing laws prohibiting harvesting forest products from wildlife sanctuaries
2. Dogs should not be permitted within CWS at any time.

Pollution

In CWS, villagers use toxic materials in water to kill fish for food. There is concern that toxic water could adversely affect thamin ingesting these scarce water sources. Travelers and villagers leave garbage and trash in CWS. The long-term accumulation

of non-biodegradable materials could impact thamin either directly (i.e., they may ingest rubbish or harmful materials) or such items may harm the environment making it unsuitable for thamin.

Solutions:

1. Create public education program to inform villagers of the health risks associated with eating fish harvested using toxic chemicals, emphasizing the long-term damage to water supplies that can harm both people and wildlife.
2. Create public education programs to inform the public about the dangers of that garbage (plastic bags, etc.) pose to wildlife.

Infectious Disease From Livestock

There is great potential for infectious disease from cattle to be transmitted to thamin (or to other ungulates). This already has occurred in other sanctuaries (e.g., Shwesettaw). This could become an increasing problem as the number of cattle within CWS increases. Infectious diseases include foot and mouth disease and anthrax, among others.

Solution:

1. Request that township veterinary officer implement vaccination program for livestock in villages in and around CWS.

BUFFER ZONE WORKING GROUP

The 1992 Myanmar Forest Law permitted the establishment of protected forest within which local resource needs could be met (i.e. equivalent function to buffer zones). The 1994 Wildlife Law provided for buffer zones under new regulations. Buffer zones can play an important role in thamin conservation, providing a practical means of absorbing human pressures on thamin habitat, while also helping to meet local community needs along the periphery of Protected Areas. Under current legislation, Buffer Zones are established outside the legally defined boundaries of Protected Areas, but previously buffer zones could be created within Protected Areas.

The working group identified five main issues pertaining to the creation of buffer zones:

1. Lack of financial and technical resources to manage Buffer Zones sustainably
2. Lack of Buffer Zone policies and laws
3. Excessive extraction of forest resources
4. Lack of clear policy and legislation regarding land use
5. Lack of awareness of the links between environmental conservation and sustainable livelihoods

Lack of Financial and Technical Resources to Manage Buffer Zones Sustainably

Current financial and technical resources are inadequate to sustainably manage Buffer Zones. Additionally, new technology and resources are unavailable to reduce demands on limited forest products.

Solutions:

1. Identify and secure funds and technical assistance from international government and non-government sources to implement buffer zone policies within protected areas inhabited by thamin. Local communities should contribute their knowledge, expertise and labor to buffer zone management.
2. Explore opportunities for deriving income from sustainable use of Buffer Zones; income could be used to support Buffer Zone management, thereby reducing reliance on external funding.
3. Initiate, strengthen and develop training programs focused on Protected Area management, with emphasis on Buffer Zones. Identify opportunities for training overseas that complements in-country training programs. Identify opportunities and resources that will permit senior government policy and decision-makers to participate in international conferences, seminars, training workshops and discussions concerned with biodiversity conservation and management.
4. Co-ordinate provision of extension services with other ministries (e.g. Agriculture, Livestock, Health, Education), thereby reducing costs of raising awareness and applying Buffer Zone management principles among local communities.

Lack of Creation of Buffer Zones Policies and Laws**Solutions:**

1. Ensure that Wildlife Regulations include adequate provisions for Buffer Zones creation and management.
2. Develop mechanisms to secure support for enforcement of laws regulating Buffer Zones. Ensure cooperation from all levels of government (e.g., ministry, district, local government agencies such as Peace and Development Council); this is particularly important given the high turnover rate of government appointees.
3. Secure support for Buffer Zone management policies from local villagers through dialogue.

Extraction of Resources

A diversity of resources are extracted from forests, including fuel wood, construction poles, thatch, forage (cattle grazing), water (for humans and livestock), game (poaching) and minor forest products (e.g., honey, medicinal plants, bamboo,

mushrooms). Currently, extraction of forest products is uncontrolled, and there is a lack of information to determine whether the current rates of extraction are sustainable. Currently, there are insufficient natural resources outside of Protected Areas available to meet the needs of communities living adjacent to, or within, Protected Areas. There also is no clear government policy or legislation regulating land use within Protected Areas and Buffer Zones.

Solutions:

1. Develop and implement community-based management plans for sustainable use of specified natural resources within Buffer Zones.
2. Department of Forests should propose land-use policies regulating Protected Areas and Buffer Zones, and present their recommendations to the Ministry of Environment.

Lack of Awareness of the Links between Environmental Conservation and Sustainable Livelihoods

There is a lack of awareness of the links between environmental conservation and sustainable livelihoods at local and national levels. Consequently, the conservation of biodiversity is given low priority within government agencies

Solutions:

1. Ensure that governmental accounting procedures assign reasonable value (economic, social, cultural etc.) to environmental resources.
2. Coordinate and utilize governmental extension services to demonstrate links between environmental conservation and sustainable living.
3. Encourage the exchange of information and experiences with national and international governments and conservation organizations.

INFRASTRUCTURE WORKING GROUP

The Infrastructure Working Group identified the following key issues:

1. Motivation, efficiency and staff morale are in need of improvement.
2. More training opportunities are needed for wildlife staff.
3. When the Government makes assignments, it often does not take into account the expertise of its staff.
4. There is a need for improved communication between different sectors of Myanmar society, which deal with wildlife and environmental issues.

Motivation, Efficiency and Staff Morale are in Need Of Improvement.

The staff of the wildlife division are not adequately trained to do the best job possible. The Wildlife Ministry has few resources and an insufficient budget. There are several components to this issue:

1. Staff salaries are inadequate. All Ministry staff are underpaid; their salaries do not meet living requirements. Additionally, there are limited employment opportunities for family members to supplement family income.
2. Few resources are available for equipment, vehicles, and maintenance of park equipment; in general, park budgets are small.
3. Few books and educational materials are supplied to parks and their staff.

Solutions:

1. Re-institute a rice allowance to park staff. All park staff stationed at remote sites must receive an additional stipend to compensate for the lack of other incomes for self and family.
2. Consider the establishment of a merit system (see Appendix II, this report). A system of tests, which would demonstrate staff knowledge and ability of the staff, could result in cash and badge rewards for staff that achieve pre-set levels of expertise.
3. Increase revenue to parks. There are many possibilities that could be explored that would increase the funds available to be used at the Park Warden's discretion. These funds could be used to provide staff stipends and awards.

Specific to Chatthin and Schwesettaw:

Institute a permit system for use of park resources by villagers. All foreign scientific teams also should be charged a reasonable fee for use of the park and facilities. At Schwesettaw, a donation box with a sign could be placed at the pagoda to encourage tourists to contribute to the park. (Presently, the park maintains the only road into the temple area, but the temple receives all revenue from tourists and the park receives none.) The main road and bridges through Chatthin should be improved and maintained so that villagers may pass through the sanctuary quickly with a minimal impact. All equipment should be used efficiently to conserve use of fossil fuels and deterioration of the equipment. This would include increased rainwater collection and storage, and possible solar power use.

More Training Opportunities are Needed for Wildlife Staff.

There are limited opportunities for technical training in wildlife related topics in Myanmar; there is no long-term plan for human resource development. At present, no vocational wildlife training is required for entry-level positions in the wildlife division, and there are no courses or curricula in wildlife management and conservation given at the forest school in Pyin-Oo-Lwin (there is only a 2-year forestry course, and a 2-week course in Resource Administration).

The Wildlife Division's greatest training need is for basic training in wildlife biology. In addition, the Division needs specialized training for the higher level staff. Legal aspects of wildlife administration and endangered species trade are two such areas of need. Within the division, people tend to be more generalized rather than having specialized expertise. There is a need for staff to develop their skills in particular areas of expertise.

Solutions:

1. Establish eligibility criteria for park staff that includes both park experience and basic training in ecology and park management. Consider not transferring staff into leadership positions from outside the division, as these transfers reduce morale and may lead to inappropriate management decisions.
2. Establish wildlife curricula at Yangon and Mandalay Universities that include both undergraduate and graduate studies. This training would include a field component that emphasizes direct work with wildlife and with park management. Curricula would include some form of internship that provides students with direct experience under the supervision of experienced staff.
3. Develop both vocational and graduate wildlife curriculums at the Institute of Forestry in Yezin.
4. Establish short specialized courses and workshops that could be conducted both at the central Forestry Development Training Center in Hmawbi and at individual parks, focusing on specific, specialized needs identified by wildlife department staff.
5. Allow more travel to meetings so that staff may increase knowledge of recent advances in wildlife conservation.

Work Assignments Do Not Take Staff Expertise Into Account.

Traditionally, the Division has not taken into account expertise of staff when making assignments and transfers. Staff members with expertise and knowledge are sometimes transferred to areas where their knowledge is not used.

Solution:

1. Consider elevating the Wildlife Division to departmental status, so that specialized divisions can be created and funded. These divisions would include, but not be limited to, research, education, community relations, and law enforcement.

There is a Need for Improved Communication Between Different Sectors of Myanmar Society Dealing with Wildlife and Environmental Issues (e.g., Ministries, NGOs, and Universities).

The advantages of using collective knowledge in different sectors of society are not realized, because communication is limited or not taken advantage of to its fullest extent, and/or in some cases, non-existent.

Solutions:

1. Several ministries have a direct influence on wildlife issues: Agriculture, Watershed, Fisheries/Livestock, and the Military. These ministries are in addition to divisions within the Forestry Department, such as MTE, which directly impact wildlife. There are two potential avenues for increased communication:
 - a) The wildlife division could host annual cross-ministry workshops that deal with specific topics, such as land-use planning around protected areas that strive for concrete recommendations for specific parks that are endorsed by all parties.
 - b) We recommend the creation of liaison officers between the wildlife division and other ministries. These individuals would be at the Deputy Director General level and would be responsible for keeping the wildlife department informed of meetings and decisions that are made by other ministry that might impact sanctuaries or parks, and also would bring wildlife department concerns to the attention of other ministry officials.

PUBLIC AND POLICY-MAKER AWARENESS WORKING GROUP

This working group identified four primary issues surrounding the theme of public and policy-maker awareness with regard to the conservation of thamin. These were:

1. Economic pressure is stronger than conservation.
2. There is a lack of awareness among policy and decision-makers at all levels.
3. It is difficult for staff to participate because of a lack of money, time and resources.
4. There is a general lack of environmental conservation awareness among the public.

Economic Pressure is Stronger than Conservation.

Economic pressure on the natural resources of the country is stronger than ever both on the government and the people. Economic hardship, and an absence of conservation awareness and proper land use policy, have resulted in the increased conversion of wildlife habitats to agricultural land by both the government and the local people. Additionally, wildlife and forest products are being over-harvested, both legally and illegally.

Solutions:

1. Create income-generating activities for villages, such as tourism, livestock breeding, etc.

2. Invite government policy-makers to workshops and to visit reserves (both nationally and internationally).
3. Through research and concrete data, demonstrate/highlight the continual benefits of sustainable management and use, both for the government and local people.
4. Compile and review reports from other countries showing how tourism in wildlife habitats can mean more economic benefits than agricultural land use.
5. Effective land use policies and regulations should be established as soon as possible.
6. Study/demonstrate how habitats can provide benefits to agriculture (marshes, forested hill sites, wind breaks, wildlife corridors).

There is a Lack of Awareness Among Policy and Decision-Makers at All Levels.

The lack of conservation awareness is interactive with many factors. The result of some of these interactions has been a restriction of meaningful participation by the government sectors and also by the public sectors in conservation activities. Lateral and vertical information flow is very poor and cross-sector approaches to decision making has traditionally been rare or ineffective. Bottom-up approaches to dealing with conservation problems have not been fully utilized.

Solutions:

1. Demonstrate that the bottom-up approach (by local people) can increase agricultural output and income through improved farming systems.
2. Set up a cross-sectional, integrated mechanism for resource management to facilitate decision-making.
3. Devise and implement a reward system for staff ideas that result in financial savings to the Government.
4. Demonstrate that better information access can improve efficiency. For example, information on fuel-efficient stoves and solar energy could lead to the implementation of actions that save fuel.
5. Establish models that show that bottom-up (participatory) resource management is more effective than conventional management system.
6. Show that movement of information laterally can improve efficiency and prevent duplication.

It is Difficult for Staff to Participate Because of a Lack of Money, Time and Resources.

Currently, no system of salary incentives, rewards or professional advancement exists; this limits the willing and effective participation of staff. There is a need to formulate effective legislation and to build institutional capacity in terms of training, facility and equipment to encourage staff to perform their duties properly. Additionally, vast improvements in information flow and networking nationally and internationally are needed.

Solutions:

1. Promote partnerships with NGOs to help with professional development (e.g., Smithsonian Institution training) and training opportunity (e.g., the Thamin project with Smithsonian Institution).
2. Demonstrate that the private sector can increase productivity and profit by providing attractive incentives such as better salaries, rewards, and personal progress (e.g., compare public and private industries).
3. Build institutional capacity.
4. Promote partnership with private industries to increase financial support.
5. Amend legislation so that it can be more effective.
6. Increase opportunities for professional collaboration with national and international universities.

There is a General Lack of Environmental Conservation Awareness among the Public.

At present, the livelihood needs of the people outweigh the conservation ethic. Because of limited institutional capacity and poor staff morale, creating conservation awareness among the public is a difficult task. More funding, qualified educators, and promotion of education programs in the media are needed. Currently, it is difficult to access more remote parts of the country, where the majority of the Protected Areas are located.

Solutions:

1. Use environmental educational center (EEC) as a venue for holding discussions among community members about conservation issues.
2. Promote cooperation with religious centers to promote conservation.
3. Collaborate on educational activities through eco-development and ecotourism.
4. Improve access to remote villages near the Protected Areas (e.g., improve roads and public transportation).

5. Seek resource assistance from local and national businesses and NGOs.
6. Wildlife educators and staff should set up a program to visit and provide education programs to local villages (i.e., outreach program). Additionally, trained wildlife educators should work with local schools to develop environmental education programs, including curriculum and teacher training.
7. Improve environmental training for wildlife educators.
8. Increase funding for public education. (e.g., extending the use of media).

The group identified as the highest priority project the use of the CWS education center as a community center. The CWS can then become a model for education, new methods of management and new projects can be developed to benefit both the forest, the thamin and local people. Detailed steps to achieve this are outlined in the working group report (Section 2).

Concluding Comments

This workshop represents a first step in defining key issues affecting the long-term survival of thamin in Myanmar. The recommendations and suggestions contained within the document represent a range of the many options available for management of this species in its habitat. These recommendations, and this document, should be viewed as the first step in an iterative, yet urgent, process to manage thamin. There may be components of a comprehensive management strategy that still need to be elaborated, or possibly may have been overlooked. This document attempts to provide preliminary, yet concrete suggestions for immediate steps that can be taken to ameliorate human pressures on thamin habitat, while also making suggestions to help meet local community needs within the area surrounding the primary thamin habitat, Chatthin Wildlife Sanctuary.

The situation facing the thamin is critical. Human populations surrounding the CWS are growing at a rate of more than three percent per year. The concomitant encroachment of their activities into thamin habitat also is predicted to occur at about the same rate, with critical habitat decreasing to less than 100 km² within 5 years. Models developed during this workshop showed the critical need for **immediate** action if the decline in the thamin population is to be slowed or stopped. These models suggested that the probability of extinction of the thamin population does not decline to a tolerable level (below 10%) until virtually all the human related threats have been removed (i.e., poaching, risk of disease from livestock reduced, and the sanctuary managed under a plan of long-term stability). Stopping this population decline will not be a matter of applying one solution, but rather a combination of solutions suggested in this document, addressing the many issues that have been identified. If the thamin is to survive long-term, difficult choices soon must be made by the government of Myanmar and its people, for it is in their hands in which the ultimate fate of this rare and delightful creature rests.

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Table 2. Issues, Themes and Problems Affecting the Conservation of Thamin in Myanmar, as identified by workshop participants in plenary discussion.

Population Biology

- Habitat loss
- Poaching
- Human disturbances

Threats to Thamin

- Habitat loss (14)
- Poaching (7)
- Pollution
- Human impact/disturbance (2)
- Villages within sanctuaries (2)
- Loss of resources for thamin

Buffer Zone Creation

- Poverty
- Protection outside of sanctuary
- Role of buffer zones (in conservation of thamin)
- Insufficient supplies of forest products outside of protected areas
- How to create sustainable buffer zone
- Overexploitation of natural resources by local communities
- Lack of sustainable income form ecosystem for the villagers

Infrastructure

- Lack of advanced training
- Limited staff/salaries of park personnel to enforce law and develop solutions
- Salary of staff
- Lack of institutional capacity
- Lack of wildlife management
- Research needs

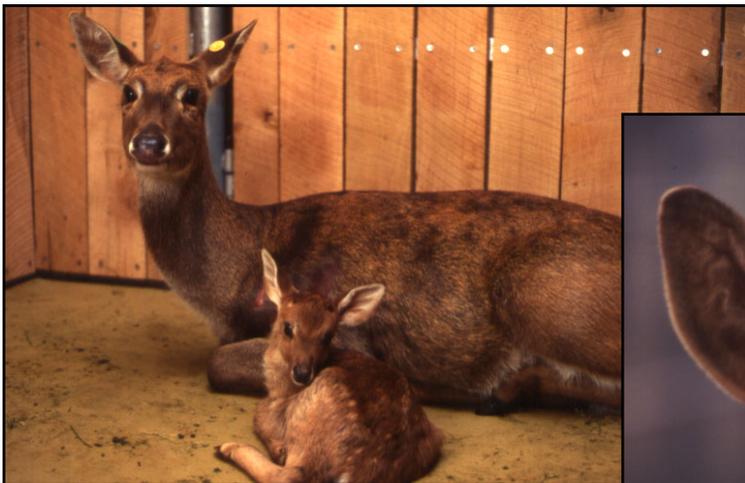
Public and Policy-Makers' Awareness

- Community awareness
 - Lack of education in conservation
 - Local residents participation in management
 - Environmental awareness
 - How to make thamin and habitat more valuable than now to local people
 - Lack of knowledge
 - Lack of concern for species survival
 - Lack of awareness among the decision-makers in different levels
 - Lack of awareness among policy makers (authorities) and decision-makers
-

Thamin (*Cervus eldi thamin*) POPULATION & HABITAT VIABILITY ASSESSMENT

**FINAL
REPORT**

Yangon, Myanmar
24-28 January 2000



SECTION 2

WORKING GROUP REPORTS

Population Biology and Population Viability Modeling Working Group

Introduction

Population viability assessment (PVA) simulation models are tools for exploring the potential fates of populations. Through incorporation of detailed information on the biology of a population, its threats, the interaction of its life-history parameters (survival and reproduction) with its environment, and potential management actions, PVA models allow wildlife managers to more completely understand the populations under their charge. PVA models can be used to:

- Identify those life-history characteristics that play a critical role in determining the viability of a population;
- Evaluate the effect of potential threats (poaching, disease, habitat loss, etc) and identify which are the most critical in terms of affecting viability; and
- Help evaluate the effect of different management actions.

We used the population simulation program VORTEX (Version 8.03, Lacy 1999) to help understand the viability of the thamin in the Chatthin Wildlife Sanctuary (CWS) in Myanmar.

VORTEX measures population viability in terms of two parameters: the probability of the population going extinct and the loss of genetic diversity in the population. For this exercise, these parameters were evaluated over a 100 year period.

Using data collected on the thamin in the CWS, we first developed a simple model of the life-table. Since several important life-history parameters were not known, we then explored the sensitivity of the model to these parameters by entering a range of values into the program to determine how they might affect the model outcome. If the outcome (probability of extinction) varied little across the range, then the model was not sensitive to that parameter and a precise measure of that parameter was not considered to be critically important.

We then evaluated the effects of threats to the population. We modeled a number of scenarios covering a wide range of possible threat conditions. This helped other working groups to develop action recommendations to eliminate or reduce those threats that were considered the most critical to the viability of the population. We conclude with a series of recommendations.

DATA ON POPULATION BIOLOGY

Data on the population biology of thamin in CWS derive primarily from three sources: (1) annual estimates of thamin density based on transect surveys conducted since 1991; (2) Data on group composition of deer sighted between March 1995 and January 1999; and (3) a radio tracking study of 19 deer from 1995 through 1999 (Myint Aung, in prep).

Data on Population Density

Table 1. Annual estimates of thamin abundance in Chatthin Wildlife Sanctuary based on line transect surveys conducted the first week of April (from M. Aung, in prep.)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999
Density (deer/km²)	9.3	7.8	4.7	4.8	4.1	4.7	5.8	5.9	6.3

The density estimates in Table 1 can be used to provide estimates of total thamin numbers in the CWS over time. The CWS is composed of three areas:

1. Chatthin Reserved Forest (121 km²). This area is considered prime habitat and is the area in which the line transects were placed;
2. Chatthin Extension Reserved Forest (49 km²);
3. Adjacent unclassified forest (98 km²).

Areas (2) and (3) are not considered prime habitat and density of deer in these areas may be 50% or 30% of the density in prime indaing habitat (B. McShea, pers. Comm). Table 2 shows estimates of total thamin numbers based on these density estimates.

Table 2: Estimates of total number of thamin in CWS based on density and habitat quality estimates.

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999
Density (thamin/km²)	9.3	7.8	4.7	4.8	4.1	4.7	5.8	5.9	6.3
Assume density is the same throughout entire CWS	2492	2090	1260	1286	1099	1260	1554	1581	1688
Assume density in non-prime areas is 50% of prime area	1809	1517	914	934	797	914	1128	1148	1225
Assume density in non-prime area is 30% of prime area	1535	1288	776	792	677	776	958	974	1040

In 1999, estimates of total population size range from about 1000 animals to about 1700 individuals.

Table 2 also shows a sharp 40% decline from in density between 1992 (7.8km²) and 1993 (4.7/km²). This is attributed to a period of relaxed park management and enforcement that occurred when the sanctuary changed administration. The data also show the population recovering from the decline. Average population growth during the recovery from 1995 to 1999 is about 11%/year ($r = .109$).

Radio Tracking Data

Nineteen adult thamin, (11 males and 8 females) were radio tracked over an approximately three-year period. During the study, four thamin were killed by dholes (wild dogs), one by a poacher, one of unknown causes, and two were lost (missing). Two thamin also dispersed from the population. In total, thamin were tracked for 279 animal/months (M. Aung, in prep).

After much discussion by the **Threats To Thamin Working Group**, it was concluded that the dhole mortalities should not be considered part of the “normal” adult mortality of thamin. Mortality associated with wild dog attacks should rather be considered as periodic episodes of elevated mortality. Extensive efforts have been made to identify the presence of dholes in the reserve without success and thamin carcasses resulting from dhole kills have not been routinely found in the sanctuary, certainly not at a number reflecting the relative mortality indicated by the radio tracking data (i.e. 50-67% of the total adult mortality being due to dholes, or approximately 100-150 kills per year¹).

Therefore, adult mortality rates were calculated as follows:

Excluding missing animals from mortality = 2 deaths.

2 deaths/(279 animal months) = .0072 mortality/month = .9929 survival/month.

Annual survival = (.9929 survival/month)¹² = 8%.

Including the 2 missing animals doubles the mortality rate to 16%. Thus, depending on whether or not the missing animals are included, estimates of adult mortality range from 8 to 16%. For most of the analyses presented, we used 12% mortality (mid-way between 8 and 16%) since “missing” animals could be due to dispersal or mortality.

The sample sizes were too small to estimate adult mortality rates for males and females separately. However, pre-adult male and female mortalities were adjusted to achieve sex ratio proportions observed in the wild (see below).

Wild dog (dhole) mortalities were included as periodic episodes of elevated mortality. VORTEX best includes these types of effects as “catastrophes.” To include this effect we based the frequency of these episodes on the frequency of observed occurrences of dhole predation during the study period. There was one major predation episode during the 9 years of study, or 11% chance. Adult survival rates were reduced by 20% during these episodes (i.e. from average of 84% survival to 68% adult survival).

Data on Group Composition

Sightings of deer throughout the year provided excellent data on group composition. At the end of the birth season (February), the ratio of adult females to fawns was 71%. Thus, 71% was used as the proportion of adult females breeding per year. Ratio of adult males to adult females was 0.63.

Life-Table Construction

The studies on the thamin in CWS provided estimates of adult mortality (8-16%), proportion of females reproducing (71%) and total population size (1000-1700).

Other information obtained from group discussions included:

Age of first reproduction: Males = 4, females = 2
Age of last reproduction: Age 11.

Missing were estimates on pre-adult mortality and differences in male and female adult mortality rates. We therefore adjusted both of these mortality rates until they met the following constraints:

- a) overall population growth rate of $r = 0.11$ (to reflect the observed growth rate of the population as it recovered over the last 5 years, table 2);
- b) ratio of adult males to females is approximately 0.63;
- c) and a relatively low proportion ($< 10\%$) of adults reach longevity (11 years of age).

These constraints were met by the following conditions:

Male mortality:

Age 0-1 = 13%
Age 1-2 = 5%
Age 2-3 = 5%
Age 3-4 = 10%
Adult = 12%

Female mortality:

Age 0-1 = 13%
Age 1-2 = 5%
Adult = 12%

There were no estimates of between year variation in any parameters from which to estimate the effect of environmental variation. To incorporate environmental variation, we defined it as 30% coefficient of variation of its associated parameter (e.g. environmental variation for adult mortality, 12%, was assumed to be 3.6%).

Carrying Capacity

Within recent years, the density in the prime habitat has approached 10 thamin/km². Using this as the maximum capacity density for prime habitat, and 5 thamin/km² as the capacity density for non-prime habitat, the CWS, under current conditions has a capacity of:

$$(10 \text{ thamin/km}^2 \times 121\text{km}^2) + (5 \text{ thamin/km}^2 \times 147 \text{ km}^2) = 1945 \text{ thamin.}$$

Threats

Wild dogs (dholes) were already identified as a potential threat and were included as described above.

Other threats include:

1. Effect of unstable/changing sanctuary administration
The drop in thamin density in the CWS between 1992 and 1993 (and its failure to rise for the next 3 years) was identified as being related to relaxed management and enforcement of sanctuary regulations, in particular failure to limit extensive human use of park areas. This was recognized as a potential future threat as well so it was included in the model relative to its observed frequency (once in nine years during which the census was monitored = 11%) and its observed effect (4.7density/7.8 density = 40% decline in overall survival).
2. Human impacts
The Threats to Thamin Working Group identified illegal human impacts as the primary threats to the thamin population. These threats included poaching, removal of wood for fuel and building, removal of thatch, grazing of cattle in the sanctuary, potential for disease transfer from livestock to thamin, and pollution (toxins used to catch fish and trash might pose a threat to thamin). U Myint Aung and his staff have done extensive surveys of the extent to which the human populations utilize the resources of the reserve and have documented the human population growth rate as 3%.
3. Withdrawal of Forestry and Wildlife Staff and Support from CWS
Continued support from the Department of Forestry and Division of Wildlife is vital to the survival of the thamin in CWS. If the resources, staff and protection provided by the government were to be withdrawn, the sanctuary would almost certainly undergo dramatic and rapid decline and invasion by settlers from the surrounding areas who view the habitat as desirable for grazing, sources of wood and agriculture. Under these conditions, the thamin population would be expected to survive no longer than 1 to 5 years.
4. Disease transmission from livestock to thamin
The Threats to Thamin Working Group identified the potential of disease transfer from cattle to thamin as a serious threat. We included disease as a catastrophe in VORTEX. There has already been a report of a case of foot and mouth disease in thamin in the CWS. Since this disease is present in cattle in Myanmar, we included a

fairly high probability of incidence (5%) with a devastating impact on the population (75% increase in mortality rate).

5. Poaching

Poaching is a documented problem in the CWS. One of the thamin with radio collars was poached, and the remains of as many as five other animals were found during the radio tracking study (M. Aung, in prep.). The Threats Working Group suggested that as many as 30-40 thamin may be killed per year as a result of poaching.

POPULATION VIABILITY PROJECTIONS

1. Population viability under current conditions without further encroachment of human populations

Population viability was assessed under current mortality and reproductive rate conditions including the threats of wild dogs, poaching (40/year), potential effects of unstable park management and transfer of disease from cattle. For these analyses, further encroachment of the human population upon the CWS was not considered. So this models the human use of the CWS as it is currently perceived today. We estimated population viability for population sizes ranging from N = 100 up to N = 2000.

Results: Probability of extinction with 100 years was at or above 98% for all population sizes modeled. Mean time to extinction was less than 32 years in all cases (figure 1). Detailed results are scenarios N100 – N2000 in the appendix.

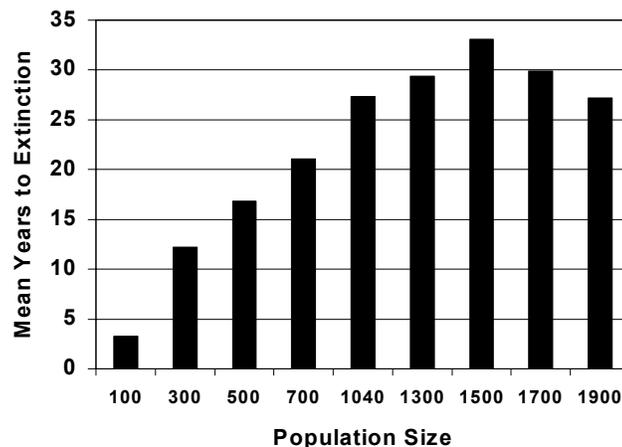


Figure 1: Mean number of years to extinction for populations of varying size under threats posed by disease from cattle (5%/year, 75% reduction in survival), poaching (40 thamin/year), 11% chance/year of park instability resulting in 40% decline in survival and sporadic wild dog invasions resulting in 20% reduction in survival.

Conclusions: Clearly the present threats pose a major risk of extinction over the immediate short term for this population. For the population of size 1040 (representing the current population), the chance of extinction is high (31%) within the next 10 years,

and virtually a certainty (89%) within 20 years. Considering in addition the impacts of future human population growth and encroachment on the CWS only add to the likelihood of extinction.

2. Removal of threats: Reduced Poaching and Disease Risk

Two threat-reducing actions can be taken immediately. These include increasing vigilance against poaching, and inoculation of local cattle to protect against disease transfer from cattle to thamin (see Threats Working Group Report for more details).

To model the potential impact of reducing these two threats, we reduced poaching in increments of ten from 40 to 10, then 5 and reduced probability of disease transmission from 5% to 1% in increments of 1%. We kept the impact of a disease at 75% reduction in survival.

Results: Results are shown in figure 2. Reducing either of these threats alone will not substantially reduce the risk of extinction (i.e, reducing poaching to 5/year but keeping the disease threat at 5%. Still results in over 80% extinction chance and reducing disease from 5 to 1% while keeping poaching at 40/year disease remaining at 5% chance; figure 2). However simultaneously reducing both does begin to reduce extinction risk. For example, reducing disease risk to 2%/year and reducing poaching to 5 thamin/year reduces extinction probabilities to 40% while reducing disease to only 1% reduces extinction risk to about 20%. Detailed results are scenarios DP1 through DP25 in the Appendix to this section.

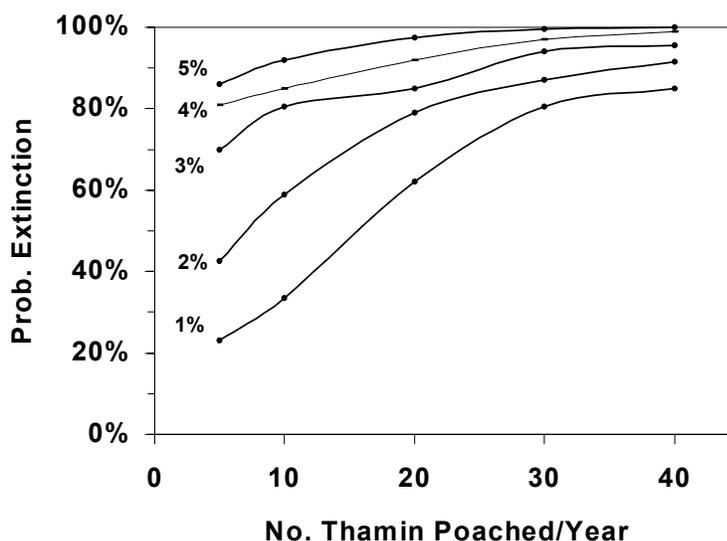


Figure 2. Changes in probability of extinction by reducing poaching and risk of disease. Percentages in graph represent probability of disease/year.

It is almost impossible to completely eliminate either of these threats so the 1% disease risk and 5 thamin/year poached probably represents the most optimistic situation

possible with these two threats. The extinction risk at this level (above 20%) is still an unacceptably high risk by most standards.

3. Additional Effect of Human Impacts

The interactions between humans, their domestic animals and the thamin are complex. The models above assume that human populations will remain as they currently are except for the measures that reduce their poaching and potential for livestock disease transmission. Data from the field show that the human population is growing at 3%/year and other impacts on the CWS are likely to increase even if poaching and disease issues are dealt with. This includes use of forest products, presence of people and dogs in the sanctuary, etc.

McShea et al. (1999) were able to show in their regional landscape analysis of thamin habitat, that in no cases were there thamin living in habitats with core areas less than 100km². **If assuming a simple 3% linear decline in the core area of CWS (121km²), it will take only 6 years before the core area drops below 100km².** Whether this means that in 6 years time the area will be incapable of maintaining a viable population of thamin is difficult to determine. In the absence of any major threats (i.e. including only a low level of poaching, 10 thamin/year, stable park management, 1% disease threats, and wild dogs) our model shows that a population of 1000 deer (the estimated capacity of 10 thamin km² in 100 km²) has a good probability of survival (4% chance of extinction). This is of course assuming the population is free from other forms of human impact. It also does not include any significant decline in reproduction or survival rates that most likely accompanies the reduction of core area. We have no data on this relationship. In fact, the only data we have is that thamin populations are not present in core areas less than 100km². Given that the CWS core area is only 121 km², any further encroachment of human activities is clearly undesirable.

4. Converting Entire CWS into Prime Thamin Habitat

The total area of CWS is 268km². If the total area were converted to prime thamin habitat, would this be sufficient to improve thamin viability to within tolerable limits (0 – 5%) given that disease and poaching can also be reduced? Obviously this would entail moving the villages from CWS, an option which was discussed by the Threat and Buffer Zone Working Groups.

We modeled the impact of increasing the capacity of the CWS by changing the time-scale over which this would occur. Poaching was reduced to 10/year and disease probability to 2%. Thus both of these were reduced, but not to the extent modeled earlier because of the continued human presence at least for some time. Figure 3 shows the effect on probability of extinction if the habitat stayed as it is (REMAIN), or was allowed to develop into ideal core area (268km² with thamin density of 10/km²) over 20 years, over 10 years or over 5 years. Details of these simulations are Runs REMAIN, and REMOVE 5 to REMOVE 20 in the Appendix.

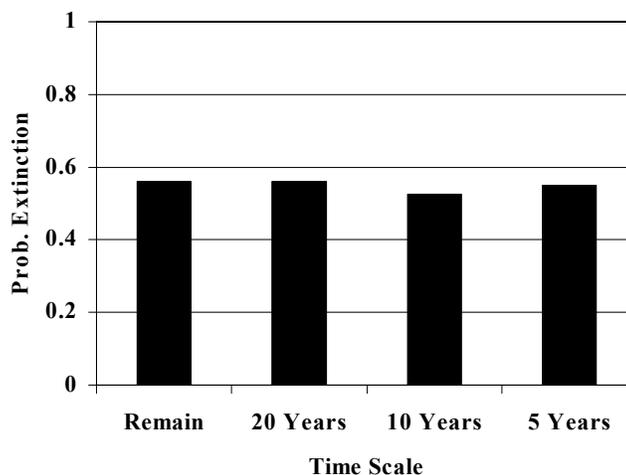


Figure 3. The effect on the probability of extinction if the habitat remained unchanged (stayed as it is) or is allowed to develop into ideal core area (268km² with thamin density of 10/km²) over 20 years, over 10 years or over 5 years.

The probability of extinction basically remains unchanged even if the CWS were allowed to fully recover its degraded habitat over the next 5 years. The reason for this is two fold. First, the current thamin population, estimated at 1040, is still well below the carrying capacity of CWS (1945 animals). It would take time for the population to grow to that number. With recovery of the degraded habitat, the population should be able to fully recover in 15 years ($r = 0.03-0.04$, Appendix). The second and more serious problem is that the remaining threats that face the population are still substantial enough to be significant. The results are the same even if disease is reduced to 1% and poaching reduced to 5/year. Increasing core area still keeps the probability of extinction at 20% (figure 2).

5. Stabilizing Park Management over the Long-Term

Finally, we considered the effect of stabilizing the management of the park over the long term to minimize the chance of the thamin population experiencing effects like the drastic drop in density observed after 1992. We modeled the effect of reducing this probability from 11% to 1% in increments of 2%. In the “High” scenario we used poaching at 10/year and disease at 2%, while in the “Low” scenario we used poaching at 5/year and disease at 1%. The results are shown in figure 4 and as runs “High 11% - High 1%” and “Low 11% - Low 1%” in the Appendix to this section.

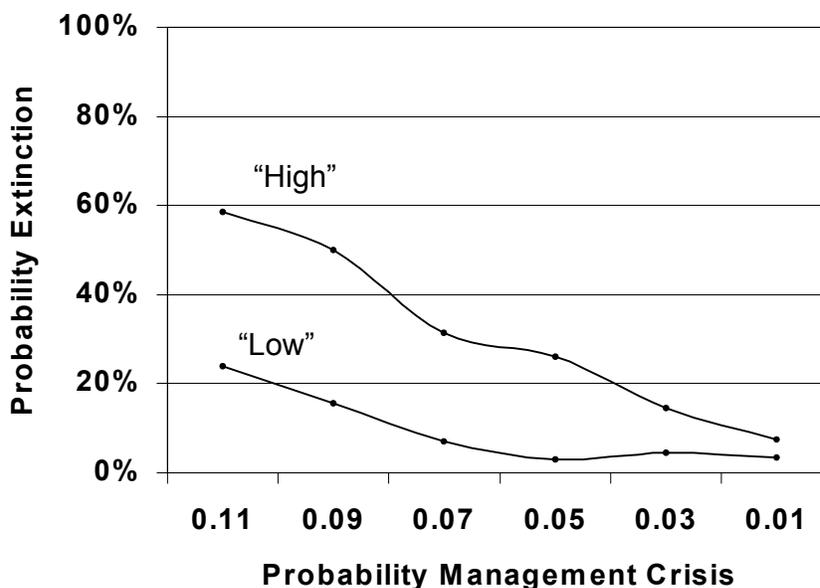


Figure 4. The effect of reducing the probability of instability in park management from 11% to 1% in increments of 2%. In the “High” scenario we used poaching at 10/year and disease at 2%, while in the “Low” scenario we used poaching at 5/year and disease at 1%.

Probability of extinction does not drop to below 10% until the probability of a management crisis declines to at most 3% for the “High” risk scenario and at most 7% for the “low” risk scenario. Under the conditions defined above, this translates into a management crisis of the magnitude observed in 1992 occurring only once in 20 years.

SUMMARY

Our models show that the probability of extinction of the thamin population does not decline to a tolerable level (below 10%) until virtually all the human-related threats have been removed. This means poaching reduced from 40/year to 5 to 10/year, risk of disease from livestock reduced to 1 or 2%, and the sanctuary managed under a plan of long-term stability. The only identified threat that has not been removed, and which has minimal effect on extinction, is the threats posed by wild dogs.

RECOMMENDATIONS

1. The severest threats to the thamin population relate to the presence and use of the Chatthin Wildlife Sanctuary by humans and their livestock and domestic animals. The most substantial threat-reducing action would be to remove this presence or reduce the direct impact of the villagers on the core area of the sanctuary. This includes removal of cattle from the reserve (to reduce disease potential), exclusion of human (and domestic animal) activities in the reserve (this is detailed in reports of other working groups).

2. Annual surveys must be continued to provide basic data on density of thamin in the sanctuary. Surveys should sample all habitat types in the reserve (core as well as degraded) to provide estimates of the total deer population size.
3. Human use of the core and degraded areas should be monitored annually. Specific survey techniques should be developed if not already in use. The goal is to be able to detect changes in the pattern and frequency of human use of these areas. This should include areas of cattle use, evidence of poaching and habitat degradation.
4. Surveys should be designed to provide total population size estimates with a specific level of precision of +/- 20%. Confidence intervals should be calculated for survey results.
5. The conservation and management of thamin in CWS should be of the highest priority but depending solely on CWS as the only reservoir for this species is too risky given the severity of the risks facing the population. Establishing and maintaining additional populations of thamin should be explored. This should include populations in other reserves as well as populations in zoos around the world.
6. Zoo populations should continue to be managed as a genetic and demographic backup to the CWS population. If the CWS population goes extinct, these populations could be used to reestablish a population in CWS if and when appropriate.
7. Training of staff in wildlife management techniques should continue. Training should include basic wildlife management and environmental education (as detailed in other groups).
8. To determine the viability of the population, data on pre-adult and adult mortality rates, and proportion of females breeding are vital. Radio-tracking studies should continue to provide estimates of these rates. Monitoring of 20 or more deer on a continuing basis would provide much needed estimates of these rates as well as identification of the primary causes of mortality.
9. Population viability should be continuously assessed as data are accumulated. Appropriate staff should be trained on methods of population viability analysis.
10. Basic and applied research of all kinds should be encouraged in the reserve. While research on the ecology of thamin is important, other types of research should also be conducted.
11. The working group on Threats identified pollution (toxins for fishing and trash) as a potential threat. Periodic monitoring of animal health and post-mortems should be conducted when appropriate to determine cause of death to determine the severity of these threats.

Appendix. See footer of table for explanation of columns.

Det r **Deterministic growth rate of the population. Does not include effect of environmental variation, but does include effects of catastrophes.**

- Stoc. R Average growth rate of population over all simulations. SD(r) is its standard deviation over simulations.
- PE Probability of extinction
- N-extant Average size of populations that did survival until 100 years.
- SD(Next) Standard deviation of pop size of those that survived
- N-all Average pop size of all (surviving and “extinct”) populations at year 100. SD(Nall) is its standard dev.
- Het Average % Expected heterozygosity retained in extant populations at year 100. SD(Het) is standard dev.
- AlleIN Average number of alleles surviving in extant populations at year 100. SD (A) is standard dev.
- Med TE Median number of years to extinction for those populations that went extinct
- Mean TE Mean number of years to extinction for those populations that went extinct.

Run	det.r	stoc.r	SD(r)	PE	N-extant	SD(Next)	N-all	SD(Nall)	Het	SD(Het)	AlleIN	SD(A)	Med.TE	MeanTE
	0.007	-0.637	0.406	1	0	0	0	0	0	0	0	0	2	2.3
N100	0.007	-0.381	0.352	1	0	0	0	0	0	0	0	0	3	3.3
N300	0.007	-0.13	0.382	1	0	0	0	0	0	0	0	0	8	12.2
N500	0.007	-0.13	0.427	1	0	0	0	0	0	0	0	0	12	16.8
N700	0.007	-0.112	0.404	0.99	717.5	439.11	7.17	78.05	0.9818	0.0021	101	11.31	15	21.1
N1040	0.007	-0.083	0.387	0.975	1249.6	804.32	31.41	226.39	0.9775	0.0087	95.2	41.61	22	27.3
N1300	0.007	-0.092	0.402	0.99	292	97.58	2.92	29.94	0.9692	0.0051	59	4.24	24	29.4
N1500	0.007	-0.076	0.389	0.98	745	722.67	14.9	137.14	0.9712	0.0036	65	13.64	27	33.1
N1700	0.007	-0.091	0.407	0.985	1605.67	521.97	24.16	202.53	0.984	0.0098	140	58.92	26	29.9
N1800	0.007	-0.088	0.397	0.985	1609.33	52.08	24.23	196.17	0.9828	0.0048	126.67	31.26	28	29.7
N1900	0.007	-0.102	0.415	0.98	888.25	801.5	17.77	158.83	0.971	0.013	87	63.62	23	27.2
N2000	0.007	-0.089	0.395	0.99	704	596.8	7.04	81.98	0.9859	0.0039	121.5	30.41	27	31.8

Run	Prob. of Disease	# Poached	Det.r	stoc.r	SD(r)	PE	N-extant	SD(Next)	N-all	SD(Nall)	Med.TE	MeanTE
DP1	5	40	0.007	-0.128	0.432	1	0	0	0	0	21	25.6
DP2	5	30	0.007	-0.105	0.419	0.995	100	0	0.5	7.07	25	31.3
DP3	5	20	0.007	-0.101	0.412	0.975	1383.8	834.22	34.59	246.78	31	34
DP4	5	10	0.007	-0.084	0.398	0.92	785	574.56	62.84	265.44	40	42.1
DP5	4	40	0.014	-0.107	0.397	0.99	1121	1142.68	11.21	138.08	23	28
DP6	4	30	0.014	-0.084	0.375	0.97	881.17	634.44	26.53	181.16	29	34.7
DP7	4	20	0.014	-0.074	0.371	0.92	733.25	620.85	58.67	262.34	38	39.3
DP8	4	10	0.014	-0.071	0.38	0.85	590.17	654.42	88.53	327.17	43	42.4
DP9	3	40	0.022	-0.082	0.366	0.955	1125.56	592.79	50.65	262.38	26	30.4
DP10	3	30	0.022	-0.077	0.356	0.94	1337.92	757.06	80.28	364.89	29	34.1
DP11	3	20	0.022	-0.059	0.339	0.85	894.03	758.23	134.1	431.51	43	40.8
DP12	3	10	0.022	-0.053	0.344	0.805	683.9	651.79	133.41	393.57	58	51
DP13	2	40	0.03	-0.055	0.321	0.915	987.47	708.16	83.94	341.38	38	39.3
DP14	2	30	0.03	-0.05	0.314	0.87	884.27	608.94	114.95	368.05	41	39.8
DP15	2	20	0.03	-0.041	0.311	0.79	1031.79	702.17	216.86	528.21	51	46.3
DP16	2	10	0.03	-0.024	0.306	0.59	890.99	713.27	365.33	632.5	83	55.8
DP17	1	40	0.037	-0.039	0.277	0.85	1066.87	608.86	160.03	447.07	43	41.9
DP18	1	30	0.037	-0.035	0.281	0.805	990.82	655.07	193.21	486.64	51	46
DP19	1	20	0.037	-0.02	0.266	0.62	917.14	648.44	348.54	598.02	76	51.5
DP20	1	10	0.037	0	0.248	0.335	1025.73	685.92	682.18	739.97	0	64.1
DP21	5	5	0.007	-0.074	0.385	0.86	580.43	581.12	81.27	294.25	46	47.4
DP22	4	5	0.014	-0.06	0.36	0.81	661.13	635.05	125.64	377.6	60	52.1
DP23	3	5	0.022	-0.048	0.342	0.7	681.52	597.15	204.46	451.39	68	52.6
DP24	2	5	0.03	-0.014	0.285	0.425	996.79	717.74	573.15	734.26	0	63
DP25	1	5	0.037	0	0.254	0.23	880.23	634.05	677.79	668.56	0	68.5

Run	Det.r	stoc.r	SD(r)	PE	N-extant	SD(Next)	N-all	SD(Nall)	Het	SD(Het)	AlleIN	SD(A)	Med.TE	MeanTE
Remain	0.03	-0.025	0.294	0.56	634.52	583.52	279.24	498.53	0.9612	0.0331	73.24	43.83	92	56.9
Remove 5	0.03	-0.023	0.299	0.55	1171.11	936.9	527.04	856.55	0.9741	0.0262	109.16	58.86	92	52
Remove 10	0.03	-0.021	0.3	0.525	1123.42	884.68	533.63	828.26	0.976	0.0195	111.46	59.67	94	54.5
Remove 20	0.03	-0.028	0.301	0.56	898.03	919.71	395.23	754.61	0.9673	0.0285	88.7	58.17	86	52.3

Run	Det.r	Stoc.r	SD(r)	PE	N-extant	SD(Next)	N-all	SD(Nall)	Het	SD(Het)	AlleIN	SD(A)	Med.TE	MeanTE
High 11%	0.03	-0.023	0.292	0.585	901.8	672.46	374.31	620.25	0.9704	0.0355	93.67	42.78	81	54.7
High 9%	0.038	-0.011	0.293	0.5	1050.65	658.19	525.42	701.98	0.9732	0.0246	102.77	51.52	100	54.9
High 7%	0.038	-0.01	0.287	0.5	1077.43	653	538.74	709.77	0.9756	0.0197	106.46	52.58	99	56.1
High 5%	0.046	0.006	0.274	0.315	1141.73	671.35	782.14	768.52	0.9776	0.0153	107.68	47.83	0	54.1
High 3%	0.054	0.017	0.267	0.26	1167.16	655.52	863.71	762.11	0.979	0.0163	113.54	46.9	0	56.9
High 1%	0.063	0.036	0.242	0.145	1396.44	635.1	1193.96	766.51	0.9838	0.0094	135.96	48.82	0	55.7
High 11%	0.071	0.043	0.239	0.075	1380.81	655.16	1277.28	727.83	0.9806	0.0232	134.46	52.45	0	57.1
Low 11%	0.037	0.002	0.251	0.24	1050.02	639.02	798.01	715.52	0.9753	0.0171	98.06	45.8	0	60.7
Low 9%	0.046	0.013	0.242	0.155	1096.61	710.13	926.63	764.22	0.9768	0.0183	108.17	48.69	0	57.4
Low 7%	0.054	0.031	0.223	0.07	1288.47	629.98	1198.28	691.07	0.982	0.0148	131.3	48.46	0	67.1
Low 5%	0.062	0.041	0.214	0.03	1413.81	630.18	1371.4	666.04	0.9831	0.0138	139.41	50.43	0	63.3
Low 3%	0.07	0.048	0.209	0.045	1527.45	549.84	1458.71	624.03	0.9837	0.0177	151.79	51.44	0	62.7
Low 1%	0.078	0.061	0.195	0.035	1638.29	499.18	1580.95	575.78	0.986	0.0153	166.77	49.39	0	58.4

Threats to Thamin Working Group

Four direct, human-causes of decline of the thamin were listed in the plenary discussion at the beginning of the workshop. These were prioritized; each participant had four votes that s/he could distribute among the issues s/he considered most important.

Rankings are listed as follows:

1. Habitat loss (13 votes)
2. Poaching (13 votes)
3. Human disturbance (8 votes)
4. Pollution (0 votes)
5. Infectious disease from livestock (foot and mouth disease, anthrax, etc.) (0 votes)

During the first plenary, an additional threat was identified that had not been discussed in any of the groups: predation. This topic was then discussed and the same steps followed as for the other identified issues.

The group defined each of the issues in order of priority, then developed promising solutions and action steps for the solutions.

ISSUE 1. HABITAT LOSS

Degradation or conversion of habitat results in land being unsuitable for sustaining thamin. Examples include:

- Conversion of land for agriculture uses
- Construction of dams
- Increased numbers of villages on the boundary or within suitable thamin habitats throughout central Myanmar
- Increased demand for forest products (fuel wood, thatch, etc.) may lead to deforestation or degraded habitat
- Illegal wood cutting is a major problem
- Extraction of rocks and minerals used in building construction
- Commercial timber extraction has severely degraded some thamin habitat in central Myanmar
- Increased grazing of habitat by livestock, especially on the Sanctuary boundaries near villages.

In 1963, more than 78 townships had thamin, but by 1997, fewer than 20 still had thamin present.

Specific to Chatthin Wildlife Sanctuary (CWS):

Villages within the Sanctuary use sanctuary land for agriculture and grazing, and there also is a great deal of fuel wood consumption.

Cattle

With respect to cattle, there are five villages that use buffer zone areas surrounding CWS. There are 3 villages that graze their cattle within the core area of CWS, and 9 villages that graze cattle on fringe areas that encroach on CWS boundaries. In total, there are between 2,000 and 3,000 cattle that graze these areas from November to February and from May to June. While the cattle may compete for resources with between 800+ thamin that inhabit CWS, the total grazed area encompasses approximately 2,650 acres of a total 66,500 acres (0.4%). However, peak grazing occurs from November and February, which is one of the most important periods in the life history cycle of the thamin: females are lactating and males are preparing for the rut during this time. Thus, competition for grazing resources may be a problem that negatively impacts reproductive fitness in thamin.

Solutions:

1. Agriculture within CWS:

Based on biological and ecological data, we know that the long-term survival of thamin is threatened by increased human activities. It is especially important that we preserve the integrity of already-existing wildlife sanctuaries. If existing villages within the CWS are permitted to continue to grow (>3% per year), then agriculture, deforestation, poaching and cattle grazing will destroy the small amount of thamin habitat (Indaing forest) that now remains.

We therefore recommend that the Myanmar government consider reviewing the idea of relocating the Kyein, Singaung and Sathachaung villages outside of CWS, according to plans originally proposed by the chief commander of the Northwest command in 1996.

Relocation of villages will require the creation of alternative jobs to provide sources of income for displaced villagers. A total of 269 households consisting of 724 individuals would be affected if this solution were implemented. Presently, when villages are relocated, the government provides cash and land as compensation. It also constructs infrastructure such as schools.

2. Wood-cutting:

A. Enforce existing laws that prohibit illegal woodcutting in CWS. This will require improved cooperation from local authorities.

B. Create a fuel wood substitution program for local villagers surrounding CWS. This would involve providing stoves that burn wood more efficiently or utilize alternative fuels (natural gas, kerosine, coal, etc.). The establishment of a fuel wood plantation in areas adjacent to CWS (perhaps part of a buffer zone) would help to provide alternative sources of fuel wood.

- C. Use community education programs to help villagers understand how using alternative fuel sources would benefit the wildlife of CWS, while also providing them with a suitable source of fuel for cooking and heating.

Note: the suggested solution to move the three villages currently within Chattin Wildlife Sanctuary led to a great deal of discussion when presented in plenary session. A separate working group, “Resettlement of Villages,” comprised of members from both the Threats to Thamin Working Group and the Buffer Zone Working Group, was convened to briefly discuss this issue on the third day of the workshop. We recognize that this is a preliminary discussion, and that there are many important components that were either not considered, may have been overlooked or are otherwise missing. However, for the purposes of this workshop and report, a preliminary discussion among the participants was considered important.

ISSUE OF VILLAGES WITHIN CHATTIN WILDLIFE SANCTUARY AND THEIR POSSIBLE RESETTLEMENT

The group began by discussing the points on which they could agree.

Participants agreed that:

1. The three villages currently within CWS have a negative impact on the thamin population in the sanctuary.
2. Relocation of these villages outside the sanctuary might be one possible way of reducing pressures on thamin population.
3. Based on underlying assumptions of the VORTEX model (see Modeling Group Report), current growth rates (3% per year) of these three villages, as well as the other villages surrounding the CWS, will lead to the extinction of the thamin population within 100 years.
4. There is a window of time (initial simulations from the VORTEX model indicate at least 15 years) before the 3% village growth rate poses a serious risk of extinction to thamin.
5. If the villages are relocated, we must consider both people and thamin together, and not as separate entities. We also should address population growth and pressures on the reserve.
6. It is likely that villagers do not wish to be relocated, but if villages are removed and good facilities and situations are provided, then social problems will be less serious.
7. Wildlife authorities should conduct an independent study of experience in relocation in Myanmar and other countries before any action is taken.

8. Whatever is done with respect to the villages, the efforts will serve as a starting point for Myanmar.
9. Disease transmission from cattle to thamin is a serious threat.

We then discussed the issue of disease transmission from cattle to thamin separately:

1. Even if villages are relocated, cattle remaining on the sanctuary periphery can transmit disease to thamin. Presently, cattle residing on sanctuary boundaries or within the sanctuary are supposed to be vaccinated, but actual vaccination success has not been quantified.
2. Veterinarians, representatives from the Ministry of Health and other sectors should meet to discuss cattle disease as a national issue.
3. Wildlife authorities should determine ways to discourage thamin from leaving the sanctuary (e.g., moving crops away from boundary).

The group then agreed to spend time discussing two possible scenarios:

1. **What would need to be considered or provided if villages were moved?**
2. **What would need to be done/be changed if the villages remain in the Sanctuary?**

SCENARIO 1. WHAT WOULD NEED TO BE CONSIDERED OR PROVIDED IF VILLAGES WERE MOVED?

1. Involve local NGOs (e.g., FREDA), local government and villagers in discussions about relocation to provide a basis for decisions before they are made. A neutral mediator who speaks the local language and has a good understanding of local culture and government should moderate discussions. This, perhaps, could be carried out as part of developing/formulating a management plan for CWS.
2. New homes should be constructed according to villagers' wishes, with most materials provided by the government.
3. Provision of substantial financial compensation (e.g., 12 months income per family) should be considered. This would depend on the funding source for the resettlement. Other models of incentives also should be considered (e.g., provision of low or no-interest loans from a revolving fund to help villagers develop new livelihoods or sources of income).
4. Provide land and training in agricultural techniques so that the people can successfully farm and manage land in the new location.
5. Maintain social and cultural integrity as much as possible (e.g., move monasteries and/or other important buildings or structures or parts thereof, to the new site).

6. Assist in moving of personal belongings to new homes.
7. Consider wishes of villages to move close to facilities they may wish to be near.
8. Provide a choice of three or four sites for relocation so that people have options for the location of their new home.
9. Assist in moving villagers' livestock (i.e., cattle).

SCENARIO 2. WHAT SHOULD BE DONE/CHANGED IF THE VILLAGES REMAIN IN THE SANCTUARY?

1. Introduce family planning and adequate health care facilities (families presently have 4-12 children but mortality is high).
2. Explore options for removal of cattle grazing inside the Sanctuary: assess how many cattle each family really needs and explore alternatives to cattle grazing inside the Sanctuary (e.g., stall feeding of cattle, replacement of cattle by other livelihoods such as ecotourism, hiring cattle from outside the Sanctuary for plowing or replace with machinery).
3. Consider a moratorium on new house construction and other development in villages; consider disallowing homes already constructed in or bordering Protected Areas to be passed on to offspring, providing incentives to encourage villagers to leave gradually.
4. The Department of Wildlife Conservation should consider developing a management plan, in collaboration with village representatives, to maintain village activities at sustainable levels of land use within prescribed zones (buffer zones). This management planning process should be independently facilitated, with substantial and meaningful input from the villages at every step. The Management plan should include provision of incentives and disincentives to ensure that agreed-upon policies and measures are followed. (See Buffer Zone Working Group report for further details.)
5. Implement alternative fuel wood programs, by making available more efficient and/or sustainable alternatives (e.g. stoves that use less wood, solar power, propane gas). (See "Wood-cutting" discussion below under this Issue for further details).
6. Strengthen and develop an education program for villagers of all ages, with special nature conservation and language components for children (e.g., wildlife identification – this would provide potential opportunities for future employment as guides to visitors) and agro-forestry for adults.
7. Develop a system of rewards for people to assist in anti-poaching activities.

8. Dogs should no longer be allowed in villages. (Note: This, together with cattle restriction, will likely help to counterbalance jealousies of villagers living on periphery of sanctuary.)
9. Explore the idea of re-forestation projects or planting fuel wood plantations for villagers' use.
10. At all stages, continue to pursue further dialogue with villagers to help identify other ideas/projects.

POSSIBLE IMPLEMENTATION STEPS

1. As a first step, provide villagers with the option of either being resettled or developing and implementing a management plan to enable them to remain living within the Sanctuary.
2. Develop a sanctuary management plan in accordance with provisions in #4 above within 2 years. **The Management plan should include criteria by which effectiveness of implementation will be assessed after 5 years.** (Note: where possible, and in agreement with villagers, commence implementation of components as soon as practicable.)
3. The Wildlife Department should implement land use management and regularly (annually) evaluate and modify/develop such management, in continual consultation with stakeholders (villagers, Department of Wildlife Conservation, etc.), as appropriate (i.e., adaptive management).
4. An independent evaluation team should assess the effectiveness of implementation after five years based on previously agreed criteria (see above).
5. Based on the results of the independent evaluation, decide whether to continue with the management plan or resettle villagers.
6. This entire process (including resettlement if decided) should be completed within 10 years.

[Note: several individuals submitted comments concerning this controversial issue after the workshop, emphasizing that the ultimate responsibility to protect CWS lies with the government of Myanmar. CWS was designated as a fuel reserve for people before it was declared a Sanctuary. In light of this, if the decision were made to move the villages, then socioeconomic issues for villagers who lived in the park before its establishment should be of equal importance to thamin conservation. Villagers would need to be provided with facilities to meet their satisfaction. If villages are not moved, then immediate actions to allow people and thamin to live together in CWS, without harm to the thamin population (e.g., immediate moratorium on forest clearing) are essential. A third alternative not discussed in this workshop was the possibility of moving thamin to another

protected area. Regardless of the final decision, the needs of all involved parties, including the thamin, need to be considered.]

ISSUE 2. POACHING

Thamin are hunted for their meat and antlers throughout their range in Myanmar. Hunting methods include spotlighting (at night) and the use of firearms, spears and snares.

Specific to Chatthin Wildlife Sanctuary:

Poaching of thamin is considered a major threat to the CWS population. Most poaching is believed to be undertaken by villagers living within CWS. Some poachers also come from villages surrounding the CWS.

Hunters in six villages in and around CWS use firearms for poaching. Hunters in two other villages use spears as weapons. Hunting parties usually are comprised of two to three men. Staff estimate that there are two hunting parties (attempts) per month totaling 24 per year. Sometimes more than one deer per hunt is killed. Between 15–20 hunts are likely to be successful with a total of 30-40 deer poached per year.

In Shwesettaw Wildlife Sanctuary there were two confirmed poaching incidents in 1999 with four deer killed (three deer were killed in the first incident and one deer was killed in the other). We estimate that there are 24 hunting parties (attempts) per year with 30-40 deer poached annually in Shwesettaw Wildlife Sanctuary.

Solutions:

1. Confiscate all firearms given to village military teams by township authorities (this applies to Kawlin Township only). Request special cooperation from the Division Peace and Development Council to restrict distribution of firearms.
2. Enforce existing laws prohibiting poaching.
3. Increase efficiency of CWS staff anti-poaching patrols. This might require things such as: the development of incentives for staff (awards, money); purchase of four-wheel-drive vehicles; improvement of guard outpost buildings.

Action Steps:

1. The CWS Wildlife Warden should request that the Director of Wildlife (U Khin Maung Zaw) write a letter routed through the Ministry of Forestry to Divisional Chairman of the State Peace and Development Council (SPDC, Saigaing Division) requesting that all firearms given to military teams in Kawlin townships be confiscated to minimize the threat of poaching with firearms.
2. U Myint Aung will submit letter to Township Chairman (SPDC) requesting assistance with enforcing laws relating to illegal poaching and illegal removal of forest products in CWS. The letter should be copied to Township police and Township courts.

3. The Wildlife Division should create a fund to be used to provide rewards for anti-poaching team patrols. Anti-poaching teams would receive US\$100 for each successful apprehension of thamin poachers, to be distributed equally among anti-poaching team members. Smaller rewards will be given for apprehending people illegally extracting forest products (this amount will be defined in the proposal). A total of US\$1,000-1,500 per year is required. Request direct assistance from an external NGO or other support group (e.g., Smithsonian Institution, Wildlife Conservation Society). U Myint Aung will write a letter describing the need for funds so that this request can be presented to potential funding organizations.
Timeline: to be completed by April 1, 2000.
4. U Myint Aung will write a letter to U Khin Maung Zaw describing the need for upgrading guard outpost buildings at Nyaungon, LeKoppin, Taungya and Singaung, located at the borders of CWS. This justification will include a budget and timetable for project completion. If deemed appropriate by authorities, U Myint Aung will request direct assistance from external NGOs and other support groups (e.g., Smithsonian Institution, Wildlife Conservation Society) in securing these funds, which are estimated to cost US \$1,000.
Timeline: to be completed by April 1, 2000.

ISSUE 3. HUMAN DISTURBANCE

Specific to Chatthin Wildlife Sanctuary:

Local people collect forest products, including leaves, mushrooms, truffles, thatch grass, fuel wood and building materials. Thus, local peoples may spend considerable time within the sanctuary boundaries. Thamin may be disturbed by their presence (noise, bullock carts, etc.) or dogs, especially during the fawning season.

Humans often start fires within CWS. Although fire may have long-term beneficial effects, at certain times of the year fires may disturb critical events in the animals' annual cycle.

Solutions:

1. Enforce existing laws that prohibit harvesting forest products from wildlife sanctuaries. Exceptions would be made for the following forest products:
 - a) permits could be issued for thatch collection within CWS from December 15-31 each year. Each household would be limited to 500 pieces per year.
 - b) Permits could be issued for mushroom and truffle collection within CWS during the month of July. Each household would be limited to 10 viss.
2. Dogs should not be permitted within CWS at any time.

Action Steps:

1. U Myint Aung will submit a proposal to the Director of Wildlife (U Khin Maung Zaw) outlining plans to permit limited extraction of thatch and truffles during specified times of the year from CWS.
Timeline: proposal to be submitted by April 1, 2000.

ISSUE 4. POLLUTION

Specific to Chatthin Wildlife Sanctuary:

Villagers use toxic industrial chemicals to kill fish for food. This is usually undertaken in small pools or streams water. There is concern that toxic water could adversely affect thamin and other wildlife that rely on these scarce water sources.

Travelers and villagers leave garbage and trash in CWS. The long-term accumulation of non-biodegradable materials could impact thamin either directly (i.e., they may ingest rubbish or harmful materials) or such items may harm the environment making it less suitable for thamin.

Solutions:

1. Create a public education program to inform villagers of the health risks associated with eating fish harvested using toxic chemicals. The program also should emphasize the long-term damage to water supplies that can harm both people and wildlife. (A Burmese language pamphlet, prepared several years by the Wildlife Division, should be reprinted for this purpose).
2. Create public education programs to inform the public about the dangers of that garbage (plastic bags, etc.) pose to wildlife.

Action Steps:

1. At the time of the pagoda festival, conduct a public education program with an exhibit (including video or slide presentations, pamphlets, etc.) telling of the danger of using toxic chemicals to catch fish, as well as the long-term damage that can be caused to people, wildlife and the environment by using toxic chemicals. This would target at least 4 villages per year.

Approximate cost: less than US\$300

Timeline: February – May 2000 and February – May 2001

ISSUE 5. INFECTIOUS DISEASE FROM LIVESTOCK

There is great potential for transmission of infectious disease from cattle to thamin (or to other ungulates). This already has occurred in other sanctuaries (e.g., Shwesettaw). This could become an increasing problem as the number of cattle within CWS increases. Infectious diseases include foot and mouth disease and anthrax, among others.

Solutions:

1. Request the township veterinary officer to implement a vaccination program for livestock in villages in and around CWS.

ISSUE 6. PREDATION

Historically, wild dogs (dholes) preyed upon thamin. Although most surveys suggest that wild dog populations in CWS are quite low, or nonexistent, they must still be considered a potential threat to thamin. There were four documented cases where thamin were killed by wild dogs between 1995 and 1996. The group discussed the

issue of predation by domestic dogs, but agreed that, with the exception of opportunistic predation on fawns, predation by domestic dogs likely was not a serious threat for adult thamin.

Buffer Zone Creation Working Group

BACKGROUND

The 1992 Myanmar Forest Law provides for the establishment of protected forest within which local resource needs can be met (i.e. equivalent to buffer zones). The 1994 Wildlife Law will provide for buffer zones under new regulations.

Buffer zones can be defined in many different ways. They can play an important role in thamin conservation, providing a practical means of absorbing human pressures on thamin habitat while helping to meet local community needs within the periphery of Protected Areas. Under current legislation, Buffer Zones are established outside legally defined boundaries of Protected Areas. Previously, buffer zones could be created within Protected Areas. Buffer Zones also provide a means of protecting forest adjacent to Protected Areas.

The United Nations Development Program (UNDP) Watershed Project previously supported the establishment of Buffer Zones. Currently, UNDP is supporting community forestry in Shan State. More information on these projects should be gathered for the purpose of forming constructive links with them if possible and in order to build on their experiences.

The working group identified five main issues pertaining to the creation of buffer zones:

- Lack of financial and technical resources to manage Buffer Zones sustainably (7 votes)
- Lack of creation of Buffer Zone policies and laws (5 votes)
- Extraction of resources (4 votes)
- Lack of clear policy and legislation regarding land use (4 votes)
- Lack of awareness of the links between environmental conservation and sustainable livelihoods (4 votes)

These issues then were expanded and further defined and the group developed promising solutions and action steps for each issue.

ISSUE 1. LACK OF FINANCIAL AND TECHNICAL RESOURCES TO MANAGE BUFFER ZONES SUSTAINABLY.

There is a lack of financial and technical resources to sustainably manage Buffer Zones, to reduce demands through new technologies and to find alternative resources from elsewhere, as necessary.

Solution 1.

Identify and secure funds and technical assistance from international government and non-government sources in order to implement buffer zone policies within protected areas inhabited by thamin.

Action step:

1. Explore opportunities within UNDP, ICIMOD, Smithsonian Institution, etc.
Responsible: Chris Wemmer and U Aung Than
Time line: by December 2001

Solution 2.

Local communities to contribute their knowledge, other expertise and labor to Buffer Zone management.

Action step:

1. Identify and inventory knowledge and expertise of villagers.
Responsible: to be determined

Solution 3.

Explore opportunities for deriving income from sustainable use of Buffer Zones to support their management, thereby reducing reliance on external funding.

Solution 4.

Initiate, strengthen and develop training in Protected Area management, with emphasis on Buffer Zones.

Action steps:

1. Develop a training program within Nature and Wildlife Conservation Division.
Responsible: to be determined
2. Identify opportunities for overseas training and technical exchanges to complement the in-country training program.
Responsible: to be determined, most likely Smithsonian Institution staff.
3. Identify opportunities and resources for senior government policy and decision-makers to participate in international conferences, seminars, training workshops and discussions concerned with biodiversity conservation and management.
Responsible: U Aung Than to coordinate
Time line: by December 2000

Solution 5.

Co-ordinate provision of extension services with other ministries (e.g. Agriculture, Livestock, Health, Education), thereby reducing costs of raising awareness and applying Buffer Zone management principles among local communities.

ISSUE 2. LACK OF CREATION OF BUFFER ZONES POLICIES AND LAWS

Note: Existing legislation provides appropriate measures for offenders, including measures for repeat offenders, and is applied by the courts. Both staff and informants rewarded for apprehension of poachers.

Solution 1.

Ensure that Wildlife Regulations include adequate measures for Buffer Zones, including provision of management plans and prevention of overexploitation of Buffer Zone resources.

Action Steps:

1. Draw on legal experience from other countries (e.g. Nepal).
Responsible: Teri Allendorf
2. Identify a mechanism for ensuring that feedback from this workshop and from local village representatives are input to the draft regulations.

Solution 2.

Develop mechanisms to secure support for enforcement from all levels of government (e.g., ministry, district, and local government agencies such as Peace and Development Council). This is particularly important given the high turnover of appointments within government.

Action steps:

1. Ensure that responsible persons are fully accountable to their seniors and to the public.

Solution 3.

Use dialogue to secure support of local villagers.

Once Buffer Zone policies and laws have been established, it will be essential to ensure that they are effectively implemented through provision of adequate human resources and strong support from relevant government departments.

ISSUE 3. EXTRACTION OF RESOURCES

Extraction of resources, notably fuel wood, construction poles, thatch, grazing, drinking water supply for humans and livestock, poaching and minor forest products (e.g., honey, medicinal plants, bamboo, mushrooms). Currently, there is no plan for the controlled, sustainable extraction of such resources.

Levels of extraction are unquantified in relation to availability of resources and, therefore, may or may not be sustainable.

Additional external pressures to Shwesettaw Wildlife Sanctuary result from pilgrims visiting a nearby pagoda (e.g., there are 200,000 visitors over 3-month festival season).

There are insufficient resources outside Protected Areas to meet needs of communities living adjacent to or within Protected Areas.

There is a lack of clear policy and legislation regarding land use (e.g., conversion of land within Protected Areas and Buffer Zones)

Note: Much of this section matches discussions of the awareness and threats groups, and also links closely with the debate on whether or not to resettle the three villages inside Chatthin Sanctuary (see Threats to Thamin Working Group Report).

Solution 1.

Develop and implement community-based management plans for sustainable use of specified natural resources within Buffer Zones.

Action steps:

1. Establish a management committee, comprising representatives of local communities, local government agencies, local NGOs and PA, to oversee preparation and implementation of management plan.
2. Survey and quantify the natural resource base and local community requirements for such resources.
3. Allocate quotas of natural resources to help meet the direct needs of local communities, based on assessments of sustainable offtake.
4. Identify potential sources of income from natural resources, based on sustainable offtake and surplus to local community requirements, and license their sustainable offtake. Revenue from licenses to accrue to Management Committee for furthering Buffer Zone management.
5. Identify measures, including incentives and disincentives, to maximize efficient use of natural resources (e.g. alternative technology, such as stoves, and alternative resources, such as solar energy).
6. Identify outstanding requirements of local communities, not met from the Buffer Zone, and introduce measures to address them.

Regarding the lack of clear policy and legislation regarding land use, it should be noted that new environmental legislation has been enacted which provides for the establishment of a Ministry of Environment. This Ministry, to be set up within the next year, will replace the existing National Committee for Environmental Affairs. Other ministries will have to consult with this Ministry with respect to their land use policies and plans.

Solution:

Department of Forests should attempt to proactively develop its land use policies for protected areas and Buffer Zones and Protected Areas on their recommendations to the Ministry of Environment.

ISSUE 5. LACK OF AWARENESS OF THE LINKS BETWEEN ENVIRONMENTAL CONSERVATION AND SUSTAINABLE LIVELIHOODS.

There is a lack of awareness of the links between environmental conservation and sustainable livelihoods at local and national levels, with consequent low priority afforded to biodiversity conservation within national agendas.

Solution 1.

Assign true values (economic, social, cultural etc) to environmental resources in governmental accounting. [8 votes]

Solution 2.

Co-ordinate governmental extension services to demonstrate links between environmental conservation and sustainable living. [5 votes]

Solution 3.

Encourage information exchange and share experiences with organizations and projects in Myanmar and other countries.

Action step:

1. Contact ICIMOD and UNDP for information about projects in Myanmar.
Responsible: Teri Allendorf
Time line: by June 2000

Infrastructure Working Group

The Infrastructure Working Group identified the following key issues:

- Motivation, efficiency and staff morale are in need of improvement.
- More training opportunities are needed for wildlife staff.
- When the Administration makes assignments, it often does not take into account the expertise of its staff.
- There is a need for improved communication between different sectors of Myanmar society, which deal with wildlife and environmental issues.
- There is a need for improved communication between different sectors of Myanmar society that deal with wildlife and environmental issues.

The Working Group then further defined these issues and suggested promising solutions and action steps.

ISSUE 1. MOTIVIATION, EFFICIENCY AND STAFF MORALE ARE IN NEED OF IMPROVEMENT.

The staff of the division lack qualities desired to do the best job possible. The Ministry currently has few resources and the budget is very limited. There are several components to this issue:

1. Staff salaries are inadequate. All Ministry staff are underpaid; their salaries do not meet living requirements. Park staff are especially affected because:
 - a) they receive very small salaries, and there is no hardship pay for living in remote areas;
 - b) they have practically no fringe benefits, such as housing, electricity, a water supply, and access to hospitals.

Additionally, there are limited employment benefits for family members to supplement family income.

2. Few resources are available for equipment, vehicles, and maintenance of park equipment; in general, park budgets are small.
3. Few books and educational materials are supplied to parks and their staff.

Solution 1.

Re-institute a rice allowance to park staff. The allocation of the rice allowance is a policy decision made by the Minister. All park staff stationed at remote sites must receive an additional stipend to compensate for the lack of other incomes for self and family.

Action Steps:

1. The final report of the Thamin PHVA will be sent to various officials of the Forestry Ministry.
2. Chris Wemmer will contact the Director of the Wildlife Division to review and discuss action steps.

Solution 2.

Consider the establishment of a merit system (see Appendix II, this report). A system of examinations would demonstrate the knowledge and ability of the staff and could result in cash and badge rewards for staff that reach pre-set levels of expertise.

Action Step:

The Director of the Wildlife Division should consider convening a working group of experienced senior park wardens (the Merit Award Task Force) to discuss and draft a proposal to establish the merit system (Appendix II). Smithsonian Institution officials may be consulted to participate directly, or perhaps to review the draft proposal and to provide consultation. If approved, the process should be conducted as an experimental system.

Solution 3.

Increase revenue to parks. There are many possibilities that could be explored that would increase the money that can be used at the Park Warden's discretion. These funds would likely best be applied primarily to staff stipends and awards. Possible ways to increase revenue could include:

- A. Consider implementing an ecotourism tax. Under this scenario, all tourists coming into the country would pay a fee for a wildlife stamp, with collected funds going to the wildlife department. An alternate idea might be to have a fee charged to all groups using a national park or wildlife sanctuary. However, since few parks are open to tourists, a general tax might provide a more consistent income source.
- B. Myanmar Timber Enterprise (MTE) has a legal and moral obligation to support the conservation of endangered species through international agreements and treaties signed by this country. MTE should consider investing a higher percentage of profit from trees harvested in the Wildlife Department.
- C. A collecting fee should be charged all private collectors of natural resources. The fee would be based on the value of the resource to outside collectors.
- D. To enhance cooperation between villages and parks, all villagers extracting natural resources from the park could have a certificate/permit signifying that they, or their village, have contributed to the park's upkeep, either through a monetary or in-kind (e.g., work) contribution.
- E. We do not recommend the construction of tourist facilities inside parks, but for those parks with existing facilities, the fee should be raised and given to the park. A portion of every room fee charged to the tourist should be passed to Park.
- F. Explore an "Adopt-a-Park" model with institutions in the developed world. This individual relationship could be fostered by staff exchanges, transfer of surplus

equipment and books, assistance of construction of guard posts, sponsorship of staff travel to international meetings, monetary contributions and/or other contributions.

Specific to Chatthin and Schwesettaw:

Institute a permit system for use of park resources by villagers. All scientific teams also should be charged a reasonable fee for use of the park and facilities. At Schwesettaw, a donation box with a sign could be placed at temple to encourage tourists to contribute to the park. (Presently, the park maintains the only road into the temple area, but the temple receives all revenue from tourists and the park receives none.) The main road and bridges through Chatthin should be improved and maintained so that villagers may pass through the sanctuary quickly with minimal impact. All equipment should be used efficiently to conserve use of fossil fuels and deterioration of the equipment. This would include increased rainwater collection and storage, and possible solar power use.

Action Step:

The Minister/Director General should examine and present these proposed policy changes to the coordinating committee for discussion and review. This review could identify appropriate avenues and agencies for revenue enhancement. For example, implementation of the "Adopt-a-Park" model could be pursued by collaborators such as the Smithsonian Institution through sister organizations in the United States. Smithsonian will send materials to the Director General/Director of Wildlife explaining this concept and its application.

ISSUE 2. MORE TRAINING OPPORTUNITIES ARE NEEDED FOR WILDLIFE STAFF.

There are limited opportunities for technical training in wildlife related topics in Myanmar; there is no long-term plan for human resource development.

1. At present, no vocational wildlife training is required for entry-level positions in the wildlife division.
2. There are no courses or curricula in wildlife management and conservation given at the forest school in Pyin-Oo-Lwin (there is only a 2-year forestry course, and a 2-week course in Resource Administration).
3. Yangon Technological University has recently developed a Diploma and Masters Degree in Environmental Planning and Management. However, no wildlife or conservation curricula are offered at Myanmar's universities at either the undergraduate and graduate level (there are no advanced degrees offered in these areas).
4. Very limited and irregular opportunities are available for wildlife staff training outside of the country.
5. Only the Wildlife Conservation Society, Smithsonian Institution, International Crane Foundation, FRED A, and the California Academy of Sciences have offered wildlife training. JAICA finances forestry training in Japan for sessions lasting up to 3.5 months. ITTO has also offered funding for training in Thailand.
6. The Wildlife Division's greatest training need is for basic training in wildlife biology. In addition, the Division needs specialized training for the higher level staff. Legal

aspects of wildlife administration and endangered species trade are two such areas of need.

7. Within the division, people tend to be more generalized rather than having specialized expertise. There is a need for staff to develop their skills in particular areas of expertise.

Solution 1.

The Wildlife Division should establish eligibility criteria for park personnel that includes (a) park experience and (b) basic training in ecology and park management. Staff should not be transferred into leadership positions from outside the Division, as these transfers reduce morale and may lead to inappropriate management decisions.

Action Step:

The Merit Award Task Force should also address eligibility criteria as part of their charge.

Solution 2.

Establish wildlife curricula at Yangon and Mandalay Universities that include both undergraduate and graduate studies. This training would include a field component that emphasizes direct work with wildlife and with park management. Curricula should include some form of internship that provides students with direct experience under the supervision of experienced staff.

Action Step:

A copy of the final report from this workshop should be sent to the Education Minister by the Minister of Forestry (Minister to Minister). Copies of the report should also be sent independently to the Rectors of Yangon and Mandalay University.

Solution 3.

Develop both vocational and graduate wildlife curriculums at the Institute of Forestry in Yezin.

Action Step:

U Aung Than will present a copy of the final PHVA Report to the Rector of the Institute of Forestry in Yezin.

Solution 4.

Establish short specialized courses and workshops that could be conducted both at the central Forestry Development Training Center in Hmawbi and at individual parks. These courses should concentrate on specific, specialized needs identified by wildlife department staff.

Action Step:

U Uga will initiate discussion of this solution with U Khin Maung Zaw.

Solution 5.

Allow more travel to regional and international meetings so that staff may increase knowledge of recent advances in wildlife conservation.

Action Step:

The Director of Wildlife should consider attempting to use appropriate channels to promote the allocation of more funds from the Division of Budget and Accounts.

Specific to Chatthin and Schwesettaw:**Action Step:**

The park wardens should determine the training and experience of all staff. They should identify training needs and pass this information on to interested training institutions. We recommend senior personnel obtain advanced training that allows the formation of specialized teams (see below). The park warden should insure that all staff has received some instruction in the importance of conservation and biodiversity.

ISSUE 3. WHEN THE ADMINISTRATION MAKES ASSIGNMENTS, IT OFTEN DOES NOT TAKE INTO ACCOUNT THE EXPERTISE OF ITS STAFF.

Traditionally, the Division has not taken into account expertise of staff when making assignments and transfers. Staff members with expertise and knowledge are sometimes transferred to areas where their knowledge is not used.

Solution 1.

Consider elevating the status of the wildlife division to a departmental level, so that specialized divisions can be created and funded. These divisions would include, but not be limited to, research, education, community relations, and law enforcement.

Action Step:

After reviewing this idea, we suggest that the Director of the Wildlife Division propose this initiative to the Director General of the Forest Department, who in turn would take up the proposal with the Minister.

Specific to Chatthin:**Action Step:**

Establish specialized teams that focus on specific duties within the sanctuary. With regards to thamin, there could be four teams: research and monitoring, environmental education, community relations, and permitting/law enforcement. These teams need training and supplies to carry out their duties. The head of each team would operate with minimal supervision -- the goal is to allocate and delegate responsibilities and duties (from the Park Warden). We aim to create a new system where information and decisions flow freely and move up, as well as down, the hierarchy of the park. The warden can not, and should not, make all the decisions, but should rely on "deputies" that report back and assist with his responsibilities. The warden would continue to have ultimate responsibility for decisions as well as their outcomes.

ISSUE 4. THERE IS A NEED FOR IMPROVED COMMUNICATION BETWEEN DIFFERENT SECTORS OF MYANMAR SOCIETY, WHICH DEAL WITH WILDLIFE AND ENVIRONMENTAL ISSUES (e.g., Ministries, NGOs, and Universities).

The advantages of using collective knowledge in different sectors of society are not realized, because communication is limited or not taken advantage of to its fullest extent. In some cases, appropriate channels of communication are non-existent.

Solution 1.

Several ministries have a direct influence on wildlife issues: Agriculture, Watershed, Fisheries/Livestock, and the Military. These ministries are external to and independent of divisions within the Forestry Department, such as MTE, which also directly impact wildlife. There are two potential avenues for increased communication:

- a) The wildlife division could host annual cross-ministry workshops that deal with specific topics, such as land-use planning around protected areas. The workshop would strive for concrete recommendations for specific parks that are endorsed by all parties.
- b) We recommend the creation of liaison officers between the wildlife division and other ministries. These individuals would be at the level of the Deputy Director General and would be responsible for keeping the wildlife department informed of meetings and decisions that are made by other ministries. The liaison also would bring wildlife department concerns to the attention of other ministry officials.

Action Step:

The proposed Ministry of Environment, if/when it materializes, could act upon this recommendation. A copy of the final Thamin PHVA Report should be sent to the new Ministry and to the National Committee for Environmental Affairs (NCEA) under the Ministry of Foreign Affairs.

Specific to Chatthin and Schwesettaw:

Action Step:

Use the community relations team to maintain contact with local officials. Use the education center in Chatthin as a community hall at least once a year, and allow villagers to voice concerns regarding park management policies. Produce a newsletter that would be sent to village officials to announce meetings, policy decisions, and point out the benefits that villages derive from sanctuary.

Public and Policy-Maker Awareness Working Group

This working group identified four primary issues surrounding the theme of public and policy-maker awareness with regard to the conservation of thamin. These were:

- Economic pressure is stronger than conservation.
- There is a lack of awareness at all levels among policy and decision-makers.
- It is difficult for staff to participate because of a lack of money, time and resources.
- There is a general lack of environmental conservation awareness among the public.

The group defined the issues in detail, then developed promising solutions and action steps to address each issue.

ISSUE 1. ECONOMIC PRESSURE IS STRONGER THAN CONSERVATION.

Economic pressure on the natural resources of the country is stronger than ever both on the government and the people. The economic hardship, reinforced by the absence of conservation awareness and proper land use policy, is driving the government as well as local people to convert wildlife habitats to agricultural land. Additionally, wildlife and forest products are being over harvested both legally and illegally.

Solutions:

1. Create income generating activities for villages, such as:
 - a) tourism;
 - b) livestock breeding;
 - c) increasing agricultural activities by provision of water (by irrigation for multiple cropping on existing agricultural land).
2. Invite the policy-makers to workshops and to visit reserves (both nationally and internationally).
3. Demonstrate/highlight to government and local people the continual benefits of sustainable management and use, through research and concrete data.
Demonstrate creation of sellers markets.
4. Compile and review reports from other countries showing how tourism of wildlife habitats can yield more economic benefits using land for agriculture.
5. Land use policy and land use control mechanism should be set up as soon as possible.
6. Study/demonstrate how habitats provide “ecosystem services” and benefits to agriculture (marshes, forested hill sites, wind breaks, wildlife corridors, insect control of crop pests, pollination, etc.).

ISSUE 2. THERE IS A LACK OF AWARENESS AMONG POLICY AND DECISION-MAKERS AT ALL LEVELS.

The lack of conservation awareness interacts detrimentally with many factors. Some of these interactions have been a restriction of meaningful participation in conservation activities by the government and public sectors.

Lateral and vertical information flow is very poor and cross-sector approaches to decision making has traditionally been rare or ineffective. Bottom-up approaches to dealing with conservation problems have not been fully utilized, though they have proven highly effective elsewhere.

Solution 1.

Demonstrate that the bottom-up approach (by local people) can increase agricultural output and income through improved farming systems.

Action Steps:

1. Choose one or two villages in and around the park.
2. Identify funding sources.
3. Develop a proposal for funding and submit to appropriate NGOs.
4. Create model agro-forestry or community forestry programs.
5. Demonstrate the benefits of such a program to the Ministry.

Solution 2.

Set up a cross-sectional, integrated mechanism for resource management to facilitate decision-making.

Action Steps:

1. Form a group for integrated management of CWS. This group would be comprised of the park warden, local authorities and other stakeholders.
2. Formulate procedures and responsibilities for the integrated management group.
3. Prepare an integrated management plan.
4. Implement the plan.
5. Monitor and report back to stakeholders and authorities on the success of the plan.

Solution 3.

Devise and implement a reward system for ideas generated by staff that save the government money.

Solution 4.

Demonstrate that better information access can improve efficiency. For example, information on fuel-efficient stoves and solar energy could lead to the implementation of actions that save fuel.

Solution 5.

Establish models that show that bottom-up (participatory) resource management is more effective than conventional management.

Solution 6.

Show that movement of information laterally can improve efficiency and prevent duplication.

ISSUE 3. IT IS DIFFICULT FOR STAFF TO PARTICIPATE BECAUSE OF A LACK OF MONEY, TIME AND RESOURCES.

Currently, no incentives in terms of salary, rewards and chances for personal progress are in place. This is one major factor that limits motivation and the effective participation of staff.

There is a need to formulate effective legislation and to build institutional capacity in terms of training, facilities and equipment to encourage staff to perform their duties properly.

Vast improvements are needed in information flow and networking in country as well as internationally.

More stringent controls to prohibit/monitor unauthorized use of resources by some government sectors would assist staff to perform their duties properly and with enhanced morale.

Solution 1.

Promote partnerships with NGOs that help advance professional career development (e.g., Smithsonian Institution training) and internship (e.g., the Thamin project with Smithsonian Institution). Increase opportunities for professional collaboration with NGOs within the international community.

Action Steps:

1. Identify the training needs (e.g., environmental education, law enforcement, wildlife management etc.).
2. The Director/Director General should consider initiating contact with local and international NGOs to develop partnerships through direct access to external agencies.
3. Identify people within Myanmar who can serve as “trainers” and/or people from outside Myanmar to serve as trainers, as needed and appropriate.
4. Develop proposals to appropriate potential partners (NGOs, etc.) for necessary funding.

Solution 2.

Demonstrate that the private sector can increase productivity and profit by providing attractive incentives such as better salaries, rewards, and personal progress (e.g., compare public and private industries).

Action Steps:

1. Identify existing job categories and salaries within the agency.
2. Identify similar or comparable industries for comparisons.
3. Inform policy- and decision-makers of the comparisons in #2.
4. Create a package program (projects) with NGOs/ private enterprises that will facilitate staff receiving a reasonable salary/allowance.
5. Present the package to the Ministry and seek permission for implementation.
6. Implement the package program.

Solution 3.

Build institutional capacity.

Solution 4.

Promote partnership with private industries to increase financial support.

Solution 5.

Amend legislation so that it can be more effective.

Solution 6.

Increase opportunities for professional collaboration with national and international universities.

ISSUE 4. THERE IS A GENERAL LACK OF ENVIRONMENTAL CONSERVATION AWARENESS AMONG THE PUBLIC.

At present, the livelihood needs of the people outweigh the conservation ethic. Because of limited institutional capacity and issues with staff morale, creating conservation awareness among the public is a difficult task. More funding and qualified educators are needed, and promotion of education programs in the media are needed. It is now difficult to access more remote parts of the country, where the majority of the Protected Areas are located

Solution 1.

Use the environmental educational center (EEC) also as a community center to discuss conservation issues. Promote cooperation with religious centers to promote conservation.

Action Steps:

1. Identify funding sources for bringing environmental educators and trainers to CWS for a training workshop.
2. Train staff in environmental education. Educators can also start with:
 - a) outreach program
 - b) teacher training
 - c) working with schools
3. Identify equipment that is needed for an environmental education program.
4. Find sources and identify funding for obtaining equipment.
5. Set up environmental education programs.
6. Schedule regular meetings (programs).
7. Implement regular meetings.
8. Evaluate the consequences with respect to the original objectives.

Solution 2.

Collaborate on educational activities through eco-development and ecotourism.

Action Steps:

1. Identify “ experts” on eco-development and ecotourism
2. Identify funding sources (partnership with local/ national business and NGOs).

3. Conduct a workshop on possible projects (beginning with reviewing successful project in other, similar locations).
4. Develop a list of possible projects and start-up costs.
5. Obtain needed start-up costs.
6. Start model (test) projects.
7. Monitor and review test projects.

Solution 3.

Improve access to remote villages near the Protected Areas (e.g., improve roads and public transportation).

Solution 4.

Seek partnerships with local and national businesses and NGOs for resource assistance.

Solution 5.

Wildlife educators and staff should set up a program to visit and provide education programs to local villages (i.e., outreach program).

Solution 6.

Develop curriculum and education programs and implement teacher training.

Solution 7.

Improve environmental training for wildlife educators.

Solution 8.

Increase funding for public education. (e.g., extending the use of media).

Solution 9.

Trained wildlife educators should work with local schools to develop environmental education programs.

HIGHEST PRIORITY PROJECT

The group then identified the highest priority project emerging from its discussions. This was to use the CWS education center as a community center.

In order to do this, the CWS staff needs good training in environmental education methods and projects. Once trained, the CWS staff can work with the heads of the local townships, religious leaders, business leaders and with local farmers and village leaders to set up regular meetings to discuss and promote conservation understanding and projects such as those mentioned under eco-development.

Also, once they are trained, CWS staff can in turn train local teachers in CWS, work with local schools to incorporate environmental education in their curriculum and set up an environmental education program for remote villages around Chatthin reserve.

The key to this project is identifying and bringing to CWS a small group of experts in environmental training to conduct a series of training workshops, to work with local educators and stakeholders to suggest projects and to conduct follow-up analysis.

We propose to seek outside funding to enable this vital training to occur within one year.

SPECIFIC ACTION STEPS:

1. Identify outside funding sources.
2. Identify environmental education trainers.
3. Coordinate a series of environmental education training workshops with CWS staff.
4. Conduct training workshop.
5. Determine needed equipment and other resources needed to carry out long-term environmental education programs.
6. Identify funding sources to purchase equipment.
7. After proper training and equipment has been acquired, set up a program of regular meetings with local people, working with heads of townships.
8. At these meetings, conservation issues should be discussed and the information given to all levels of wildlife staff as part of a “bottom -up” model of management through input from local people.
9. These meetings will also provide a venue to discuss projects with potential ecological and economic benefits, such as fuel-efficient stoves and sharing improved farming techniques. Projects for sustainable resource use can be explored, planned and implemented.
10. Evaluate the consequences with respect to the original objectives.

Through these action steps the CWS can become a model for education, new methods of management and new projects can be developed to benefit both the forest, the thamin and local people.

Thamin (*Cervus eldi thamin*) POPULATION & HABITAT VIABILITY ASSESSMENT

**FINAL
REPORT**

Yangon, Myanmar
24-28 January 2000



SECTION 3

APPENDICES

APPENDIX I.

Thamin Population and Habitat Viability Assessment

Hmawbi, Myanmar 24-27 January, 2000 List of Participants

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APPENDIX II.

Developing a Merit Reward System For Protected Areas Staff of the Division of Wildlife and Nature Conservation

The following outline is a preliminary framework for developing this initiative.

Step 1:

Executive Review and Decision: The Director of the Wildlife Division reads the proposal and discusses the value of the idea with his key staff. If the proposal is deemed sound, he should consider creating a Merit Reward System Task Force. The purpose of the task force is to develop a detailed proposal encompassing all of the elements of a Merit Reward System.

Step 2: Task Force Formation The task force should have a chairman and members. The Director of the Wildlife Division should form the task force. He may do this by himself, or he may delegate the task to a chairman of his own selection. All members should be senior wildlife wardens with at least ten years experience in administering protected areas and protected area staff. The Chairman is responsible for facilitating several meetings based on written agendas. The optimal task force size would be 4-5 members, including the chairman.

Step 3:

Background information on Merit Reward Systems. Smithsonian staff should assemble information on similar programs in the United States, Australia, and the U.K., Wildlife Division staff should explore the existence of such systems in Asia. Likely sources of information in the U.S. include the USFWS, National Park Service, and Forest Service. The information should be transmitted to the Wildlife Division's Merit System Task Force, and copied to the Director.

Step 4:

Task Force Actions. The task force should consider the following factors.

1. Justification. A brief justification for a Merit Reward System should be written, explaining the purpose (for example, "... to reward voluntary achievements in learning, experience and work in biodiversity, ecology, and conservation that benefit protected area management in Myanmar").
2. Defining scope. The system could focus, for example, on basic knowledge and experience in natural history, ecology, and conservation biology. It could also reward work in law enforcement. The task force would determine what kinds of achievements are important to define the scope of the system.
3. Eligibility for Reward. Eligibility for review should be elective, that is, any wildlife staff member may decide to be reviewed for merit reward.
4. Application Procedure. Candidates for evaluation would submit a simple application summarizing their service in the Wildlife Division and Forest Department, and the

area of expertise for which they wish to be evaluated (e.g., Ecology and Biodiversity, Law Enforcement, Environmental Education, Community Relations).

5. Evaluation Process. The knowledge of applicants would be tested through written and field examinations. Since this represents a considerable amount of work, the task force must determine which examinations of the various specialist areas they wish to develop first. Additional examinations could be developed in subsequent years. A written exam for example could test the applicants' knowledge of ecological concepts, principles of wildlife management, and conservation biology. The questions would be based on the teachings of Smithsonian and WCS courses, as well as textbooks provided to the Wildlife Division by these organizations. Smithsonian staff could help to design the exams and the protocol for conducting the exams. Biodiversity knowledge would be evaluated through field examinations. The applicant would be quizzed in a protected area on their ability to identify birds, mammals, reptiles, amphibians, freshwater fishes, invertebrates, and vascular plants. Questions would also be asked about life history and ecology related to species. The percentage of correct answers would determine the level of achievement.