

## Final Report: Wildlife Conservation Society

**Project Title:** Status, Ecology, and Conservation of Tigers in their Critical Habitats in Thailand, September 2001

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#### Introduction

Thailand has a comprehensive, relatively well-managed protected area system that is unparalleled anywhere in Indochina. This, coupled with an increasing public awareness of the plight of the species and increased activity in wildlife research in Thailand, means that the tiger stands a good chance of sustaining itself in the Kingdom. Building on research conducted in Thailand between 1987 and 1991, the Royal Forest Department (RFD) staff recently delineated the potential tiger populations within Thailand. This established a framework for prioritizing and conducting status assessments on the ground.

Using scientifically defensible and standardized field methods, this project sought to collate existing data and gain new information on the status and threats to tigers in potential habitats in Thailand in order to serve as the basis for developing and implementing a long term conservation action plan. An existing spatial database was updated to represent critical tiger habitats in Thailand. The database was used to archive field survey data for tigers and prey, and to analyze relationships between tiger occurrence and

environmental variables.

As part of the project, a program of practical field training for Thailand government staff was developed. This involved three levels of training. First, Royal Forest Department field staff and university students were taught techniques for monitoring tigers in potential tiger areas and collected information on tiger status in Khao Yai and Kaeng Krachan National Parks. These field survey exercises also functioned as anti-poaching patrols. The second training curriculum focused on boosting park ranger skills in protection, enforcement and monitoring. The third style of training taught those Border Patrol Police staff responsible for protecting forests in transboundary areas about wildlife trade issues, field methods for distinguishing tigers and other endangered species, and instruction in cutting edge techniques for documenting and combating wildlife crimes.

The project determined that tiger populations in some fragmented Thai protected areas (e.g., Khao Yai and Phu Khieo-Nam Nao) may be in far worse shape than previously thought, while some transboundary areas (e.g. Kaeng Krachan and Balahala) remain future strongholds for the species. Recommendations for management of the former areas include anti-poaching training for rangers, increased vigilance of enforcement staff and outreach to improve relations between park staff and local people, along with monitoring of dwindling tiger and prey populations. Recommendations for the transboundary areas include increased research to determine ecological requirements and demography of tiger and prey, inter-governmental coordination, increased protection and enforcement of existing laws, and environmental awareness programs.

## **Goals and Objectives**

- a. To determine the status of tigers in potential habitats in Thailand through rapid assessment techniques;
- b. To provide training to RFD staff which will enable them to monitor tigers at permanent assessment sites;
- c. To conduct anti-poaching efforts during tiger surveys and train park guards in appropriate anti-poaching monitoring and enforcement techniques;
- d. To establish a new field program to study the ecological requirements of Indochinese tigers within areas identified as containing critical habitats for tigers;
- e. To provide necessary information to the RFD to develop and implement an action plan for the conservation of Thailand's tigers; and
- f. To identify communities in and near critical habitats to target for tiger conservation education programs and coordinate the start of these programs.

## **Project Accomplishments**

The project executor and staff accomplished elements of all the original objectives of the project. Both field research and training goals were addressed contemporaneously. For example, status assessments for tigers and other large fauna were completed during the course of conducting training of forestry staff in tiger field monitoring methods.

All grant related training was delivered under the terms of an existing training Memorandum of Understanding (MOU) between WCS and the Thailand Royal Forest Department. Staff selected for training were those with responsibilities for research, conservation, monitoring or protection of tigers in Thailand protected areas. Two WCS/RFD tiger conservation training workshops were held in Thailand

inside Level I Tiger Conservation Units (TCUs); first at Khao Yai National Park in March 2000, and again in January 2001 at Kaeng Krachan National Park. In addition, during March and July 2001, special transboundary wildlife conservation and security training courses were conducted for 82 Border Patrol Police officers, at Kaeng Krachan National Park. The police trainings were done in collaboration with WildAid. WCS used funds from NFWF/STF towards the cost of the first police training.

Using separate funds from NFWF/STF, a monitoring program for tigers and tiger prey was established at Khao Yai National Park, in conjunction with the Khao Yai Conservation Project (KYCP), a joint initiative between WCS, WildAid and the Royal Forest Department. Other elements of the KYCP include patrol and outreach teams, trained by WCS, WildAid and other Thai and foreign agencies. WCS developed a ranger training program for Khao Yai rangers in collaboration with WildAid and the Thailand Royal Border Patrol Police. NFWF/STF funds from this grant were used towards a ranger training provided in 2000.

Formal approval to conduct the formal *research aspects* of the project was never granted by the Royal Forest Department, Research and Development Committee despite early submission of request for research permission, frequent requests for clarification of status, meetings between the RFD and WCS staff including a meeting between Dr. Ginsberg and the Director General, and frequent assurances that the permission would be forthcoming. WCS was able to train forestry staff in field conservation techniques for tigers and identify talented individuals to further field efforts in Thailand reserves, but was unable to offer opportunities to all of the individuals identified in this granting period.

Despite that WCS could not work directly with some divisions of the Royal Forest Department to gain up-to-date information on the status of tigers in all putative critical areas (Smith et al., 1999) we were able to compile and produce an updated spatial database of tiger distributions based on the anecdotal information that could be gleaned from forestry staff in some areas, formalized survey and monitoring data from Khao Yai and Kaeng Krachan, and information from recent large mammal surveys conducted by WCS in southern, central and northern Thailand. This information represents the most up-to-date information on tiger status in Thai reserves and will serve as a valuable resource for future planning and management efforts for tigers.

### **1) Tiger Survey Training**

Recent efforts to conserve biodiversity in Thailand's national forests are focusing on protected forest networks. Many forest complexes comprise multiple protected areas that each share borders with others and are surrounded by lands that have been largely converted for human use. Because these lands are protected by different laws and administrations, the challenge is to combine management efforts towards the conservation of single forest complexes.

One such area is the Upper Eastern Forest Complex that comprises Thailand's oldest park, Khao Yai National Park, and four separate protected areas to the east, and stretches to the Cambodian border. Exceeding 6,000 square kilometers in size, this is the largest area of habitat available to tigers in the country after the Western Forest Complex (WEFCOM). Historically the area was known for its tigers, elephants and wild cattle, including the now extinct kouprey. Until the late 1980's no systematic inventories of mammal fauna had ever been undertaken in the area. Khao Yai, just two hours north of Bangkok, has excellent facilities for training and makes an ideal natural setting in which to conduct field training in tiger survey and conservation techniques.

A second area of potentially even greater importance for long-term tiger conservation is Kaeng Krachan,

at 2,915 square kilometers, Thailand's largest National Park. Significantly, this area lies adjacent to extensive rainforests in Myanmar. Potentially home to up to 50 tigers, the second largest population of tigers after the WEFKOM, tigers were historically recorded in the area 85 years ago. More recently, Rabinowitz (1993) recorded tigers from the core of Kaeng Krachan's forest.

Despite a comprehensive system of nature reserves that cover 17% of land area, and permanent staff stationed in them, many Thailand Forestry Department staff require a better understanding of the field approaches necessary to determine the status, distribution and threats to tigers in these reserves. Following a previous training provided to over 600 rangers in Thai protected areas including Khao Yai (Smith 1999) and a WCS tiger survey training course in May 1999 for Cambodian and Thai wildlife and forestry staff (Lynam 1999), an advanced training workshop was held at the Khao Yai Forestry Training Centre, Nakhon Ratchasima Province, from March 15-29th, 2000 (WCS 2000). A second training was held following the same curriculum at Ban Krang Substation, Kaeng Krachan National Park, during 15-29th January, 2001 (WCS 2001).

Fifty-one Royal Forest Department staff from over 30 parks, sanctuaries, and research stations, and Thai university graduate students attended the two workshops (Figure 1). The protected area staff came largely from areas known or presumed important for tigers. Some of the participants were graduates of basic training course in wildlife field research and conservation provided by WCS and the RFD during 1997-1999 (Lynam 1999).

The objectives of the workshops were:

- to understand the ecology of tigers and the reasons for their decline;
- to review the available evidence for tigers in Thailand and identify areas where the status of tigers is unknown;
- to develop proficiency with the field techniques available for censusing tigers and their prey species;
- to learn skills in interpreting, evaluating, and reporting tiger field survey data; and
- to examine the options for monitoring and protecting tigers in remnant habitats.

Plans to conserve tigers must be based on an accurate knowledge of their status, distribution and threats in the remnant habitats. Mistakes have already been made in proposing tiger conservation priorities based on wrong impressions of the importance of certain "flagship" areas (e.g. Khao Yai), and ignorance of the importance of other lesser known areas (e.g. Kaeng Krachan, Balahala). While knowledge of tiger distributions in Thailand is at an advanced state compared to other countries in the region, there remain gaps in knowledge for some potentially important areas that must be filled. For these reasons it is still important to teach wildlife and forestry staff the range of techniques available for designing and executing field surveys, ecological studies and monitoring programs, and threat assessments for tigers. However, it is also important to instruct these staff in the options available for making tiger conservation happen on the ground once information has been collected from the field. The two advanced training courses were undertaken with the view that teaching the process of carrying out tiger conservation is preferable to focusing on isolated activities or components of the larger picture.

The first tiger workshop began with a week of classroom-based instruction followed by a week-long field exercise. A training manual was developed for the course (Lynam, Colon et al. 2000). Dr Justina Ray, a carnivore specialist and veteran trainer of three WCS basic wildlife training courses in Thailand, joined

Lynam in providing the bulk of the classroom based training. The course covered numerous topics including ecology, behavior, analyzing past and present distributions, threat assessment, survey and monitoring methodologies, and survey design. Special training in Thai wildlife law and enforcement was given by Mr Thanit Palasuwan, Chief of the Wildlife Protection Division, Royal Forest Department, and Mr Steven Galster, Codirector of WildAid, who lectured on CITES law and enforcement, anti-poaching and community outreach. The practical exercise was carried out with training participants breaking into groups to design, plan, implement and write up a short tiger/tiger prey assessment exercise.

The second training at Kaeng Krachan involved course material similar to that taught at Khao Yai in the previous year, but additionally there were special guest lectures from staff involved in tiger conservation activities, an RFD tiger captive breeding specialist, Wildlife Protection Division chief Thanit Palasuwan, WWF Wildlife Trade Campaign staff, and Khao Yai Conservation Project Project Coordinator, Alongkot Chugaew.

The workshops were designed to prepare them for future involvement in tiger research, planning, conservation and management. Both workshops identified a number of talented forestry staff with potential as tiger field conservationists. Although permission was not given to our request to work with the training graduates in implementing tiger assessments in their areas of responsibility, we hope that some individuals will be resourceful enough to find ways in which to practice their skills by independently conducting tiger field work in their theatres of work.

## **2) Rapid Assessments of Tigers and Ecological Studies in Critical Habitats**

A recent analysis of data from camera-trap studies (Carbone, Christie et al. 2001) showed that Thailand forests contain tigers at some of the lowest inferred densities in Asia. Information from surveys collected by the project executants in Thailand contributed to this dataset (Lynam 2000). Consequently camera-trap effort must be very high to detect tigers when they are present in an area. Both the training exercises conducted in Thailand as part of this project doubled as survey exercises. WCS was able to conduct field assessments for tigers at Khao Yai and Kaeng Krachan, in addition to four other areas assessed during a previous study ([Table 1](#)). The results of these exercises were both sobering and exciting, albeit in different places.

No tigers were detected from surveys conducted by the NFWF/STF sponsored training team at Khao Yai. Monitoring efforts at Khao Yai since January 1999 have so far detected only two tiger individuals, from over 4,000 trapnights of sampling over the entire park area (Figure 2). One tiger was detected from multiple photocaptures around the park headquarters area, the other from a set of tracks in a distant eastern portion of the park. Clearly, an emergency situation exists for tigers at Khao Yai. Despite previous reports, tigers are on the brink of being lost from this famous park. There are probably at most 5-10 tigers left in Khao Yai. We hear odd reports of tigers here and there but despite our best efforts to encourage rangers to record tiger sign where observed, they remain unconfirmed reports. The single tiger we know well ranges over a minimum 212km<sup>2</sup> area centered around park management facilities where prey availability is highest (Figure 1). Prey has been hit hard by years of uncontrolled poaching inside Khao Yai.

Monitoring efforts using line transect and camera-trapping techniques are currently being employed to assess trends in prey populations with the implementation of systematic patrolling inside the park and outreach efforts in communities surrounding the park. Our monitoring efforts, partly supported by a separate NFWF/STF grant to WildAid, discovered that tigers and their prey are more often encountered

in forests in the vicinity of the park management facilities than in areas more distant. The indication is that patrolling efforts are lacking in the extreme margins of the park. Clearly, knowing tiger density in the middle of the park helps us little in understanding the park's population where the park perimeter is devoid of prey. While details will be provided in a separate report to NFWF/STF, suffice to say we are using this information to try to influence and guide the system of ranger patrolling in the park.

In stark contrast to Khao Yai is a more positive outlook for tigers in Kaeng Krachan. From a total of 1,030 trapnights of sampling, 11 photocaptures of four tiger individuals were taken from an approximately 115km<sup>2</sup> area in the core of the park. Assuming the probability of detecting tigers is something on the order of a similar site in India (Bhadra) being studied by Dr. Ullas Karanth - both are composed primarily of tropical moist evergreen forest - we estimate a density of 3.5 tigers/100km<sup>2</sup>.

Aside from tigers, Kaeng Krachan supports a diverse assemblage of carnivores, including Asiatic leopard, dhole, Malayan sunbear, golden cat, and leopard cat. In fact, at some individual trap locations in Kaeng Krachan, consecutive photographs revealed the presence of all these species, indicating that prey levels are high enough to support them. Kaeng Krachan represents an ideal situation in which to conduct a detailed ecological study of tigers and prey, including mark-recapture population estimates.

In February 2001, WGBH/NOVA filmed part of a documentary on evolution and extinction with Tony Lynam and Alan Rabinowitz at Kaeng Krachan. The documentary which aired on national television in the US on September 24, 2001, featured field work with camera-traps conducted by WCS researchers that yielded photographs of tiger, other endangered mammals, and a formerly undocumented population of Siamese crocodile (*Crocodylus siamensis*) (Figure 3). WCS is currently negotiating permission to undertake a longer-term study of tigers in the reserve as part of an investment in the area through WCS's new Global Carnivore Conservation Program.

### **3) Anti-poaching Activities and Educational Activities based on Survey Results**

Since 1999 WCS and WildAid, with the support of the Thai, US and Australian Governments, NFWF/STF, and the local business community, have supported a Wildlife Protection Program in Khao Yai National Park, the first of its kind in Southeast Asia. Under this program, 30 park rangers work as a Patrol Team conducting systematic patrols across the park. A five member Outreach Team is working in communities surrounding the park to change attitudes towards natural resource conservation. In both cases the objective is to reduce poaching and to develop a model for protected area management.

During 2000, Khao Yai rangers and guards received training in techniques of navigation, safe weapons handling, First Aid, communications, community relations, Wildlife Laws and their enforcement, field arrest tactics and self defense, and patrolling strategies by WCS, WildAid and eight Royal Thai Border Patrol Police instructors (Figure 6). Border Patrol Police share similar roles to Park Rangers. Border Patrol Police are charged with protecting watersheds, forests and wildlife along country borders. Park rangers and guards who are the front-line troops engaged in wildlife conservation on the ground. They are charged with protected watersheds, forests and wildlife inside Khao Yai National Park. So Border Patrol Police staff bring appropriate knowledge and skills to share with rangers.

On 31st July 2000, a Third and Fourth Ranger Training Course was opened at Khao Yai National Park. NFWF/STF supported these trainings. The event was attended by H.E. William Fisher, Australian Ambassador to Thailand, M.R. Patarachai Rajani, Deputy Director-General of the Royal Forest Department, and Police General Somsak Kwaengsopa, Assistant Commissioner of the Border Patrol Police. The purpose of the Third Training, - a six-day exercise - was to review concepts and practical

implementation of skills necessary for Patrol Team rangers. A Fourth Training - also a six-day session - was done for 20 substation staff and officers of Wildlife Protection Units surrounding the park. Few of these forestry staff had attended formal training courses before, and they were especially keen to learn.

#### **4) New Partners in Tiger Conservation - the Royal Thai Police Office**

Poaching has become one of the major factors causing the decline of tigers and other wildlife across the planet. In Thailand, poachers hunt to survive while collecting forest products inside forest reserves, and are often supported by influential people who hire them to hunt for trophies or wild meat. Once these products have crossed the border out of a protected area, forestry staff no longer has authority to arrest and prosecute wildlife offenders, if they are caught. Clearly, other agencies must be recruited to help save tigers and their habitats.

WCS has developed a strong working relationship with the Thai Royal Border Patrol Police that is evolving on several fronts, helped by the support from NFWF/STF. The Border Patrol are helping to train park rangers in anti-poaching and outreach methods, and assisting with patrolling and enforcement in tiger reserves. In Khao Yai for example, police are working with RFD staff in a number of areas that should have measurable results in terms of tiger and prey conservation in the future:

- Conducting systematic ground and aerial patrols to assess the levels of poaching;
- Raising awareness in local villages of the importance of conservation;
- Working with krissana wood collectors to find alternative sources of employment;
- Working with the Labor Department to apply for a ban on krissana wood processing;
- Working with Forestry, Regional and Border Patrol Police to improve implementation of the Forest Resource Encroachment Prevention act, arms control and wildlife crimes control;
- Improving intelligence sharing concerning wildlife and forest crimes between the police and forest departments; and
- Training forest and wildlife staff in methods of patrolling, arrest techniques and apprehending wildlife offenders.

This initiative is the first time a national enforcement agency has collaborated with an international conservation agency to help wildlife in Southeast Asia.

#### **5) Transboundary Wildlife Conservation and Security Training**

Thai Border Patrol Police are charged with securing watersheds and forests for the people of Thailand. In protecting watersheds, the police are indirectly helping to preserve wildlife. Border areas are also subject to the illegal trafficking of wildlife. Because of its geographic location and superior infrastructure in the region, Thailand has the potential to disrupt and slow the illegal wildlife trade within and around its borders. The Thai Royal Border Patrol Police can play a critical role in enhancing the protection of wildlife in Thailand and in neighboring countries through training, field patrolling, and investigations.

Until recently the police had no formal training in wildlife conservation. This meant that police in border areas could not distinguish between endangered and non-endangered species for sale in wildlife markets, or in the field. To rectify this situation, the Commissioner of the Thai Border Patrol Police asked WCS to provide a special training in wildlife conservation to border patrol police officers stationed in border areas. WCS invited our partners WildAid, and the Royal Forest Department to join with us in providing a special "Transboundary Wildlife Conservation and Security Training" in March and July 2001. Together, we provided an initial five-day course and a second seven-day course of inter-active lectures that gave a

sound overview about international and national regulations regarding wildlife conservation, and how wildlife trafficking within and around Thailand's borders can be monitored and reduced (Figure 7; WCS/WildAid, 2001a,b). We taught them Thai and international wildlife laws, wildlife and trade monitoring techniques, navigation using Global Position System (GPS) devices, and how to identify wildlife alive in the field and dead in markets.

A publication "Wildlife in Thailand's Transborder Trade" and "Introduction to GPS" were produced in Thai language for the training (Figure 8). GPS devices and digital cameras - items of equipment that will facilitate the rapid collection of wildlife data - were donated to the Border Patrol Police.

In providing these training courses, we secured a commitment from the senior officials to allow border patrol police to provide information on wildlife that will in the future allow for the monitoring of wildlife in trade, and in the wild in remote areas, inaccessible for survey.

### **Status of Tigers in Thailand**

We suggest that the number of Thailand tigers is probably lower than the previous estimates of 250-500 tigers, probably less than 200, and may number as few as 150 individuals. This is based on some real field data and consideration of former estimates that were derived from indirect methods (e.g. interview surveys and questionnaires). The estimate is not published but the basis for the revised estimate is described as follows.

The history of estimating Thailand's tiger population dates back to the 1970's. In 1979, Pong Leng Ee, former Director-General of the Royal Forest Department estimated Thailand's tiger population at 600 (Leng-Ee 1979). Other estimates ranged from 400-600 (Lekagul and McNeely 1977; Jackson 1979). The rationale for the latter estimates was based on an estimate of the bioenergetic needs for tigers, their harvest of standing crop prey biomass, a calculation of a tiger density of 1 per 100km<sup>2</sup>, and extrapolation to the existing forest cover at the time (J. Seidensticker pers. comm.).

Rabinowitz (1993) estimated Thailand's tigers at 250. He confirmed tiger presence-absence for 38 protected areas, through interview surveys and direct surveys. He considered PA size, optimal habitat availability and presence of prey species, and an estimate of average tiger density (1 tiger/100km<sup>2</sup>) to extrapolate tiger numbers to this figure.

More recently, Smith et al. (1999) estimated a potential 500 tigers for Thailand (501 to be precise). This estimate was based on questionnaires sent to 600 rangers and guards across 100 odd protected areas. Presence-absence of tigers from forest complexes is based on these informal reports of tigers. The quality of habitat in each complex was assessed based on the species richness of potential tiger prey i.e. more species, better quality habitat, higher density of tigers. Extrapolating we get a potential population of 501 tigers. But this still doesn't tell us how many tigers are really out there.

Looking at some representative forest complexes in Thailand, Smith et al. (1999) estimated 38 potential tigers for Phu Khieo/Nam Nao, 32 for Khao Yai, 54 for Kaeng Krachan, and 19 for Balahala. Factoring in human influences on habitat and tigers that reduce potential to realized numbers, Rabinowitz estimated 20 tigers for Phu Khieo/Nam Nao, 17 for Khao Yai, 14 for Kaeng Krachan but did not estimate the number for Balahala. Both Smith and Rabinowitz have provided a useful template against which to compare the results of direct survey efforts. WCS/RFD now has field survey data to address the question.

For Phu Khieo WCS/Nam Nao, WCS and RFD conducted extensive (trail-based, ala Karanth) and



intensive (plot-based) surveys for tigers over 18 months, and detected one individual tiger in the core of sanctuary from camera-trapping (from 5 photographs and 1,886 trap nights). Using the distribution of camera-trap captures, and track and sign detections, we arrived at an estimate of 1 tiger per 78km<sup>2</sup> or 1.28 tigers/100km<sup>2</sup> (Lynam, Kreetiyutanont et al. in press). But the sanctuary is heavily poached for tiger prey species around the edges and we know that tigers have been directly poached, so tiger densities at the forest edge might actually approximate the "low density" of 1 tiger/200km<sup>2</sup> of Smith et al. A realistic number of Phu Khieo-Nam Nao tigers is 19, closer to Rabinowitz's estimate of 20, and half the potential number of Smith et al. (1999).

In Thailand's most famous park, Khao Yai, four tigers were known from the headquarters area in 1997, all photographed by rangers and naturalists. The late Mark Graham told me he once knew of twelve tigers, but unfortunately he passed away and I can't ask him how he told his tigers apart. An RFD camera-trap survey was done in 1997 and tigers were trapped near the HQ area but the photographs are now unavailable to researchers. We detected a single tiger from over 4,000 camera-trap nights of survey. Sean Austin, who studied clouded leopards in the park caught the same individual tiger six times and a different individual (one later shot by rangers) from camera-trapping in his study area. We have a dozen or so unconfirmed reports of tiger sightings and tracks from various parts of the park, but mostly concentrated in the HQ area.

We know of three tigers that were shot in the western part of Khao Yai in the last two to three years, leaving the individual we trapped repeatedly during 1999-2000. Judging by the points of capture, and track and sign locations, he ranges over a minimum 212km<sup>2</sup> (Figure 4). Strangely, no sign of this tiger has been recorded since March 2001. In August 2000, tracks of a second tiger were detected 50km away in the eastern edge of the park. This may be a transboundary tiger shared with adjacent Thap Lan. This tiger has eluded repeated efforts to document it using camera-traps. We have evidence of a possible third tiger from tracks reported by local people in the north of the park in one of the three watersheds where we haven't surveyed with camera-traps. So we have a possible three tigers for Khao Yai, with only one on film. Mark-recapture analysis can't be performed with only one tiger individual captured. So our best estimate is three. That's 29 tigers (90%) fewer than the potential number of Smith et al. and 14 (82%) fewer than Rabinowitz.

From our intensive plot sampling at Balahala (funded by the Thailand government through their Biodiversity Research and Training (BRT) Program), we estimate tiger densities at 1.2-1.8 tigers/100km<sup>2</sup>. We recorded 26 photocaptures of five tigers from 1,682 trapnights. Hunting of tigers or prey is intense in a 160km<sup>2</sup> eastern area and virtually non-existent in the larger eastern portion of the reserve due to patrolling by Border Patrol Police, assisted in part by Forest Department rangers. Therefore, assuming the lower density in the smaller fragment, and the higher density across the larger area, a direct extrapolation to the size of the forest gives 20 tigers - close to the potential number estimated by Smith et al. (1999).

Kaeng Krachan, like Balahala, is a transboundary forest area of 2,915km<sup>2</sup> adjacent to a much larger expanse of rainforest in Myanmar. Large areas of the northern, eastern and southern margins of the park are heavily poached by roving bands of Karen and Kariang tribespeople (1,600km<sup>2</sup>) and probably support tigers at low (1/200km<sup>2</sup>) density, with an intermediate disturbed area of 800 square km with tigers at intermediate (1/100km<sup>2</sup>) density, and a core area of relatively undisturbed habitat (500km<sup>2</sup>) in which tiger density is 3.5 tigers/100km<sup>2</sup>. Thus Kaeng Krachan likely supports around 34 tigers. Together

with adjacent Mae Nam Pachi WS (1,209km<sup>2</sup>), where poaching and human disturbance is high and tigers likely exist at low density, this complex probably supports around 40 tigers in total.

Smith et al. (1999) considered 15 potential Thailand tiger populations; six are in transboundary forests, and nine are isolated. While Balahala probably contains tigers at about the levels Smith et al. (1999) estimated because hunting is extremely low, other complexes e.g. Phu Khieo, Western Forest Complex, and Kaeng Krachan have protected core areas but considerable hunting pressure near their perimeters, and might support 50-75% of their potential populations. Others areas like Khao Yai clearly contain significantly fewer tigers than their potential. This seems due to intense poaching - of tigers and their prey - possibly more intense now than what Rabinowitz considered 10 years ago. Salawin, Mae Tuen, Khlong Saeng, Khao Luang, Khao Banthad, Phu Luang, Thung Salang Luang, Thap Lan, Khao Soi Dao and Huai Sala are in this category. These areas probably contain 10% of their potential numbers.

So a revised estimate of Thailand's tiger population in the year 2001 is that there are under 200 tigers across 15 subpopulations (Figure 5). To be conservative we could say the Thai population might be as low as 150 tigers. The contribution of the subpopulations to the total is estimated in [Table 2](#).

### **Evaluation and measures of success**

- Tiger survey training, rapid assessments, anti-poaching and education activities have been implemented by the WCS - Thailand Program, in collaboration with the Royal Forest Department, Royal Border Patrol Police, WildAid and other partner organizations, with support from the Save The Tiger Fund, a joint project of the National Fish and Wildlife Foundation and the Exxon Mobil Corporation;
- A comprehensive tiger-training program evolved as a result of this support. Although WCS was unable to recruit forestry graduates of the tiger trainings to conduct survey and ecological monitoring, WCS has trained 50 staff in preparation for this work, for when the permissions are secured. Additionally, WCS has trained 50 rangers and guards at Khao Yai to enhance the protection of tiger habitats, and 81 Border Patrol Police officers to monitor and halt the trade in tigers and other wildlife across country borders;
- WCS has updated the estimate for Thailand's tiger population using fresh information from direct field surveys and fewer than 200 tigers are thought to persist in the country's highly fragmented forests;
- Field assessments found that for some of Thailand's parks previously considered flagship areas for tigers, populations are instead in an acute state of decline, and require emergency help to stave off extinction. Other forests that lie in the Thai-Myanmar and Thai-Malaysia transboundary zones represent the largest and most secure habitats for tigers. Future efforts towards scientific monitoring, awareness and education will ensure the persistence of these populations and a heightened understanding of tiger ecological requirements;
- Finally, WCS has been instrumental in bringing the governments of the United States of America, Australia, and Thailand together to work towards more effective conservation of tigers and their habitats in this biologically unique and important part of Asia.

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Table 1

**Table 1. Sites assessed for tigers by direct survey and monitoring by WCS/RFD**

Proposed study area <sup>a</sup>	Forest type <sup>b</sup>	Forest complex (Smith et al. 1999)	REAS <sup>c</sup> in 97/99	REAS in 99/01	REAS left to do	Monitoring planned/in progress by WCS/RFD
Banglang NP	1	8	x			x
Thaplan/Taphrya FC	1	13	x			
Kaeng Krachan NP	1	4		x		x
Salawin NP	1	1			x	
Huai Sala/Yod Dom FC	1	15			x	
Sai Yok NP	1	3			x	
Phu Khieo/Nam Nao FC	2	11	x			
Khao Yai NP	2	12		x		x
Khao Sok/ Kaeng Krung NP	2	5			x	
Mae Ping/Om Goi FC	2	2			x	
Khao Banthat WS	2	7			x	
Khao Soi Dao WS	2	14			x	
Halabala WS	3	8	x			
Khao Luang NP	3	6			x	
Phu Luang WS	3	9			x	

a NP = National Park; WS = Wildlife Sanctuary; FC = Forest Complex.

b 1 = Forest core areas, incorporating important transboundary areas for tigers;  
2 = large (> 2, 000 km<sup>2</sup>) forest isolates; 3 = small (< 1, 000 km<sup>2</sup>) forest isolates.

c Rapid Ecological Assessments

**Table 2. Estimates of tiger numbers in 15 Thailand protected area complexes.**

<b>Population</b>	<b>Name</b>	<b>Potential</b>	<b>Estm. popn reduction</b>	<b>Estimated</b>
1.	Salawin	17	90%	1.7
2.	Mae Tuen	13	90%	1.3
3.	Western FC	178	50%	89
4.	Kaeng Krachan	54	75%	40*
5.	Khlong Saeng	31	90%	3.1
6.	Khao Luang	10	90%	1
7.	Khao Banthad	13	90%	1.3
8.	Halabala	15	0%	20*
9.	Phu Luang	13	90%	1.3
10.	Thung SL	19	90%	1.9
11.	Phu Khieo	38	50%	19*
12.	Khao Yai	32	90%	3*
13.	Thap Lan	48	90%	4.8
14.	Khao Soi Dao	13	90%	1.3
15.	Huai Sala	7	90%	0.7
Totals= 501				189

\* estimate based on direct field surveys by WCS/RFD/Thai Border Patrol Police