
PROYEK PENYELAMATAN HARIMAU SUMATERA

~ SUMATRAN TIGER PROJECT ~

TAMAN NASIONAL WAY KAMBAS, INDONESIA

*Department of Forest Protection and Nature Conservation (PHPA) ~ Taman Safari Indonesia (TSI)
IUCN CBSG Tiger Global Conservation Strategy & Minnesota Zoo*



Adult male tiger at Jl. Purbolinggo I on 12 April 1997 at 17:43 hours.

FOURTH QUARTER PROGRESS REPORT, SECOND YEAR APRIL - JUNE 1997



**SUMATRAN TIGER PROJECT:
FIELD STUDY IN WAY KAMBAS NATIONAL PARK**

**FOURTH QUARTER PROGRESS REPORT, SECOND YEAR
Period from April - June 1997**

Submitted to

Lembaga Ilmu Pengetahuan Indonesia (LIPI)
Kepala Biro Kerjasama Iptek
Save the Tiger Fund, National Fish and Wildlife Foundation, USA
Zoological Society of London, UK
Federation of Zoos' *Tiger Week* Program through the London Zoo, UK

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Tiger Watch Vol. 1, No. 1, Spring/Summer 1997.

Official Permits

Newspaper Articles

SUMATRAN TIGER PROJECT: EXECUTIVE SUMMARY

Submitted by Ronald Tilson, Ph.D., Project Director

The endangered status of the Sumatran tiger (*Panthera tigris sumatrae*) is based on an estimated population of 400-500 remaining in the wild (*IUCN/SSC CBSG Sumatran Tiger PHVA Report, 1994; IUCN Cat Specialist Group Cat Action Plan, 1996*). Another 240 Sumatran tigers live in zoos; 61 in the 11 Indonesian zoos that comprise the Indonesian Zoo Association (PKBSI). In recognition of the situation the Indonesian Government has attempted to prioritize the steps necessary for the species effective conservation, and these have been formalized in the Ministry of Forestry's (PHPA) far-sighted document, the *Indonesian Sumatran Tiger Conservation Strategy* published in 1994.

There are four general categories of recommendations that comprise the *Indonesian Sumatran Tiger Conservation Strategy* to ensure the long-term survival of Sumatran tigers throughout their remaining range. One category includes the initiation of field programs for ecological studies of the Sumatran tiger, the long-term monitoring of wild tiger populations over their entire range in Sumatra, and the establishment of criteria to resolve conflicts between tiger populations and surrounding human settlements. It is these aspects of the tiger's conservation that we hope to address within the framework of the Sumatran Tiger Project.

The Sumatran Tiger Project, located in Way Kambas National Park, is a collaborative research effort between the Indonesian Directorate Jeneral Perlindungan Hutan dan Pelestarian Alam (PHPA), the CBSG Indonesia Program at Taman Safari Indonesia (TSI), and the Minnesota Zoo. The Minnesota Zoo's Director of Conservation (R. Tilson) is the Project Director and also coordinates the CBSG *Tiger Global Conservation Strategy* (GCS) and the AZA Tiger Species Survival Plan (SSP). Our research permits are provided by Lembaga Ilmu Pengetahuan Indonesia (LIPI). Project staff are from Bogor Agricultural University, York University, UK, the University of Wisconsin at Madison, and the Universitas Lampung (UNILA). The project is administered through the Conservation Office of the Minnesota Zoo, USA.

The Sumatran Tiger Project is directed by Dr. Ronald Tilson (Surat Izin Penelitian LIPI No. 2740/II/KS/1997). The coordinator for all aspects of the Field Ecology Program is Neil Franklin; field project staff are Sriyanto (Tiger Prey Species study), Bastoni (Remote Camera Systems study), Agus Subagyo and Muhamad Yunus (Research Staff). The Coordinator for the Community-Based Conservation Program is Philip Nyhus. His permits are contained in *Second Quarter Progress Report: Six-Month Summary* (1995). His co-coordinator is Sumianto, and they were assisted by University of Lampung (UNILA) students Mohammad Taufiq and Tri Rudianti.

Sponsors

The Sumatran Tiger Field Study in Way Kambas National Park, initially funded by ESSO U.K., now receives primary support from the *Save the Tiger Fund*, a special project of the National Fish and Wildlife Foundation in partnership with Exxon Corporation. As of this quarter, a new conservation partner, the Zoological Society of London through the London Zoo, is providing support to initiate a mobile rapid evaluation team that will be responsible for censusing tigers in protected areas outside of Way Kambas. Additional field support is being provided by the CBSG

Indonesia Program at Taman Safari Indonesia, ESSO Indonesia, the London Zoo's Federation of Zoos *Tiger Week* Fund, British Airways, and the Minnesota Zoo.

Overview of Project Activities: Fourth Quarter, Second Year

This fourth quarter report of the second year of the Sumatran Tiger Project contains information from the field study of tiger ecology, which began in June 1995, and from the community-based conservation program, which began in December 1995. This report covers the period of 1 April to 30 June 1997. Previous quarterly reports about the project are listed below.

First Quarter Progress Report: Administrative Phase

(1 June to 15 July 1995, submitted 15 September 1995)

Second Quarter Progress Report: Six-Month Summary

(1 July to 31 December 1995, submitted 31 January 1996)

Third Quarter Progress Report

(1 January to 31 March 1996, submitted 10 May 1996)

Fourth Quarter Progress Report

(1 April to 30 June 1996, submitted 1 August 1996)

First Quarter Progress Report, Second Year

(1 July to 30 September 1996, submitted 5 October 1996)

Second Quarter Progress Report, Second Year

(1 August to 31 December 1996, submitted 10 March 1997)

Third Quarter Progress Report, Second Year

(1 January to 31 March 1997, submitted 10 August 1997)

Administrative Activities

During this quarter my time was primarily spent assisting the PKBSI (Indonesian Zoological Parks Association) organize their Sumatran Tiger Masterplan meeting, organizing the formation of a Tiger Conservation Team, and overseeing field programs of the Sumatran Tiger Project. Some of the highlights of these activities are listed below:

Sumatran Tiger Masterplan:

- Assisted Jansen Manansang, Co-Coordinator of the PKBSI Sumatran Tiger Program, to coordinate the PKBSI Sumatran Tiger Masterplan meeting at Taman Safari Indonesia, Cisarua, Bogor 2-3 April 1997.
- Neil Franklin, Bastoni, Sriyanto, and Sumianto (Sumatran Tiger Project staff) and Apriwan (PHPA staff) presented an evening talk about the tiger field study in Way Kambas National Park to the PKBSI delegates.
- Arranged for a post-conference tour of the Sumatran Tiger Project in Way Kambas NP for VIPs which included:
 - Peter Jackson, Chairman of the IUCN/SSC Cat Specialist Group
 - David Pepper-Edwards, ASMP Tiger Coordinator, Taronga Zoo, Australia

- Kathy Traylor-Holzer, AZA and IUCN/CBSG Tiger GCS Tiger Population Advisor, Minnesota Zoo, USA
 - Douglas Armstrong, AZA and IUCN/CBSG Tiger GCS Tiger Veterinary Advisor, Omaha's Henry Doorly Zoo, USA
 - Colin Hyde, Perth Zoo, Australia
 - Jerry Holzer, Minnesota Zoo, USA
 - Fred LaRue, Dallas Zoo, USA
 - Sarah Christie, EEP Tiger Coordinator, London Zoo, UK
-
- Created (along with P. Nyhus and Jansen Manansang) an Indonesian language conservation brochure about the role of PKBSI zoos and PHPA *in situ* programs for the conservation of tigers in Sumatra (see Appendix).

Official Permits:

- Completed research permit process through the Indonesian Institute of Sciences (Lembaga Ilmu Pengetahuan Indonesia) – see attached documents in Appendix.

Tiger Conservation Teams:

- Received funding from the Zoological Society of London through the London Zoo for support of a mobile rapid evaluation team that will be responsible for censusing tigers in protected areas outside of Way Kambas National Park. This team will be referred to a Tiger Conservation Team (TCT), a term used in the Ministry of Forestry's *Indonesian Sumatran Tiger Conservation Strategy*, 1994. As of this quarter, permits from PHPA and LIPI for this team have not been received.
- Met with Dwiatmo Siswomartono, Director of Flora, Fauna, and Nature Conservation of PHPA and Johannes Subijanto, Sub-directorate of Species Conservation (PHPA) regarding the development of the Tiger Conservation Team (see *Sumatran Tiger Project Second Quarter Progress Report, Second Year*). The process for issuing permits from PHPA for the TCTs to enter protected areas in Sumatra was initiated.
- Met with Eddy Bambang Prosetyo and Jito Sugardjito at the LIPI office in Bogor regarding collaboration of the Sumatran Tiger Project with a proposed tiger field census in Kerinci Seblat National Park by Fauna and Flora International and also discussed the permit process for the Tiger Conservation Teams to work in the provinces of southern Sumatra.
- Numerous meetings with Sumatran Tiger Project staff were held at Way Kambas in order to develop a comprehensive list of draft data sheets that will be experimentally used and refined for use by the TCT. The idea is to develop a standardized methodology that will be based upon check-sheets rather than descriptive narration. This will not only simplify the process it will lead to a more error-free data base, allow comparison between sites, and will allow other researchers to collect similar data at their sites.

- Met with Haryanto Wahyu Sukotjo and Hayani Suprahman (Bureau of Nature Conservation Service Region II) and requested maps of southern Sumatra. These maps are scheduled to be available to the TCT by mid-August.
- Met with I.L. Arisdiyo of the Remote Sensing Application Center (LAPAN) in Jakarta to discuss obtaining remote sensing imagery of Way Kambas National Park and other protected areas of Sumatra.
- Obtained a conservation grant (R. Tilson and P. Nyhus) from Environmental Systems Research Institute (ESRI), California USA that provided Geographic Information System (GIS) software (ArcView and Atlas) and digital maps (ArcWorld 1:3M, ArcAtlas: Our Earth Package, ADCW for ESRI). Additional support is being sought to obtain PC ArcInfo software.
- Awarded a conservation grant (R. Tilson and P. Nyhus) from Erdas Inc., Georgia USA to purchase Erdas Imagine and Erdas Mapsheets software for satellite remote sensing analysis. We also met with, Erdas Inc., Midwest Region Office, and their consultant about using this software to develop a Sumatra-wide GIS map. Erdas is also searching for corporate donors to provide additional satellite imagery for the project.
- Two new staff were hired: Agus Subagyo and Muhamad Yunus from the University of Lampung as new members of the TCT. Contracts were drafted and they are currently undergoing training with the STP Field Ecology team at Way Kambas to develop their skills with the remote camera system, GPS, and data collection. A new UNILA student, Ma'turidi, began his field orientation with the Sumatran Tiger Project.

Javan Tigers and Meru Betiri NP:

- Coordinated field orientation by PHPA staff from Meru Betiri National Park, Java in preparation for evaluating presence or absence of Javan tigers in their park (see attached report in *Next Report*)

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TIGER FIELD ECOLOGY PROGRAM

Progress Report: April to June 1997

Submitted by Bastoni, Sriyanto, Muhamad Yunus, Agus Subagyo – field research staff and Neil Franklin - field program coordinator

The Tiger Field Program of the Sumatran Tiger Project is based upon recommendations set forth in the *Indonesian Sumatran Tiger Conservation Strategy* published in 1994 by the Indonesian Directorate General of Forest Protection and Nature Conservation (PHPA), Ministry of Forestry. This strategy outlines the steps necessary to develop and sustain a conservation program that will ensure the long-term viability of wild Sumatran tigers. The field ecology program addresses the need for information relating to the natural history of wild Sumatran tigers and is one of the programs that comprise the *in situ* component of the Sumatran Tiger Project.

Since the beginning the Sumatran Tiger Project concentrated its efforts on the ecology and conservation needs of the Sumatran tiger in the lowland forests of Way Kambas National Park. This is the first stage of the research and management program for this endangered subspecies. This report represents a preliminary summary of activities and results for the Sumatran Tiger Project during the last quarter.

Tiger Intensive Monitoring Area

Remote camera monitoring of the intensive study site has continued throughout this quarter. Approximately 20 cameras were operated over a study site of ~160 square kilometers. Cameras were checked by field teams every 10 days, films and batteries changed, and the resulting photographs developed. Three new cameras were added to the monitoring system, in order to increase the coverage and density of cameras in important habitat types. Other cameras were maintained in their normal positions, with only minor modifications to avoid damage from elephants and other inquisitive wildlife.

Tiger photographs continued to be obtained, with further evidence indicating the reproduction of Way Kambas tigers. To date three cubs have been photographed, and one juvenile individual. These photographs will form the basis for habitat-based analysis of tiger activity, in the attempt to answer questions about the optimum conditions for tiger survival and distribution.

Many other species were also recorded by the remote cameras during this quarter, though the majority of photographs were accounted for by barking deer, wild pig, rusa deer, long-tailed macaques, elephants and civet cats. This data, with both date and time for each photographic event, will be analyzed in the months ahead in order to provide insights into the ecology, behavior and distribution of other wildlife sharing the same range as the tiger. Tiger prey abundance and distribution will be investigated using the results of the camera traps, and will be compared to the census estimates achieved using other methodologies (direct observation transects, pellet counts and print abundance techniques).

Mapping of the vegetation types in the TIMA also continued, in order that more accurate comparisons of tiger activity against habitat type could be made. All resulting habitat data was incorporated into the project's GIS map of Way Kambas National Park. It is the intention in the weeks ahead to obtain satellite imagery of the region, in order that the vegetation map can be further refined.

It is the intention of the field team, during the months to follow, to expand the geographic coverage of the camera system in order to examine the longer-range movements of study site resident individuals. Preliminary analysis of tiger ranging data has shown that male tigers may have overlapping home ranges, as opposed to previous research suggesting that male tigers are extremely territorial and exclusive in their utilization of habitat. However, though home ranges may overlap when examined on a low resolution scale, consideration of the activity of male tigers at individual camera sites shows that individual males still have a strong tendency to avoid each other (see Franklin *et al.*, *Tigers 2000*, in press).

Results from this Tiger Intensive Monitoring Area will be published in the *Tigers 2000* Conference proceedings, London, March 1997. This publication is included in this volume. Preliminary analysis suggests that there are more tigers in Way Kambas than previous estimates have suggested.

A Cause For Optimism – The Implications Of Results From Way Kambas National Park

It is a fact that tigers are rarely directly observed in Sumatra. When questioned at a tiger PHVA meeting in 1992, only a fraction of Forestry Department staff from national parks across Sumatra had actually sighted wild tigers. Even fewer of these observations represented encounters with free-ranging tigers in their natural habitat. In Way Kambas National Park only seven of the 60 forestry field staff had made direct observations, despite having spent considerable proportions of their life working deep within the tigers' range. Staff from the Sumatran Tiger Project, working with these forest rangers, encountered tigers on only two occasions during more than 950 accumulated team-field days. During 440 days in the vast, mountainous National Park of Kerinci Seblat, rhino survey teams reported no tiger sightings despite covering more than 2,800 kilometers of remote and undisturbed forest trail (Franklin & Wells, *unpublished report*), even though secondary evidence of tiger presence was recorded regularly.

In contrast to other regions of the world, fatalities attributable to tigers (both livestock and human) are also rare in Sumatra. In Way Kambas National Park only one attack has been recorded in the last 10 years (Nyhus and Sumianto, unpublished data) despite the park being surrounded on all sides by densely populated villages. Villagers seldom encounter tigers, particularly in reserves where the boundary between park and settlements is distinct. This lack of contact with tigers is exhibited in villagers' frequent comments about tigers being few, and only existing in other areas of Sumatra, when in fact tiger populations are often surviving in forests adjacent to their own farmland.

Relying on secondary signs as an indicator of tiger density is also difficult and is prone to lead to underestimation of tiger status. Pug and scrape marks are found infrequently in tropical forests,

which is primarily a result of the heavy rainfall, thick leaf litter and hard ground substrate. Where they are found they are usually of a quality and clarity that prevents measurement and classification. Feces decompose rapidly, leaving only remnant hairs of consumed prey, and these are easily missed by passing field teams.

Remote camera monitoring in Way Kambas has shown that tigers exist in considerable numbers, despite a lack of evidence from either direct observation or the presence of tiger secondary signs. Tigers are observed to be highly mobile during the daylight hours yet they remain undetected, on the whole, by the groups of people working deep within the park. Remote camera monitoring has revealed more tigers than expected. Evidence from preliminary surveys indicates that this pattern will be reflected in other areas of the tiger's range across Sumatra.

Areas outside the protected area system may also hold significant populations, particularly where habitat degradation has produced a mosaic of habitat types similar to Way Kambas. Such areas would include old logging concessions and plantations in various stages of regeneration, but which are typically underrepresented in tiger population status assessments. Anecdotal evidence to support this abounds, even close to Way Kambas National Park, where neighboring concession holders complain of their reticence to deploy staff in certain areas because of what they say is an unacceptable risk from tigers. Many other areas of Sumatra possess habitat of similar quality and composition, particularly along the plains of the eastern coast.

Our field data suggest that the past population estimate for Sumatran tigers may be an underestimate, given the high densities at which tigers may exist in conditions similar to those in Way Kambas National Park. Previous status assessments have undervalued the contribution of degraded, secondary forest/grassland habitats as potential refuges for tigers, and have overemphasized the accuracy of direct observation as an index of tiger presence or absence. Surveys to assess the tiger population in all similar areas are an immediate priority, as it is for the other mountainous, forested regions within the Indonesian protected area system. The methodology used, however, should be efficient in terms of time and personnel required, but should be comparable across the entire range of the Sumatran tiger, even when carried out by independent field teams (see section below).

Rapid Evaluation of Tiger Status

Preparations are underway (pending funding) to implement Sumatra-wide surveys of potential tiger habitat. This rapid evaluation of tiger status will provide information relating to the tiger's distribution, prey abundance, habitat type, human disturbance, human attitudes and land protection status. This data will be essential in future management initiatives concerning the conservation of the Sumatran tiger.

Methodology for the rapid evaluation of tiger status is being attempted in the TIMA area of Way Kambas National Park. Techniques are being developed that will allow trained mobile teams (Tiger Conservation Teams – PHPA, 1994) to rapidly assess the quality of a habitat, the abundance of tigers and their prey, and the likely threats that these tiger populations may face. One component of this overall methodology that is being developed involves randomly selecting

a site of dimensions 4 km x 10 km. This area is divided into a grid system, comprising ten square of equal area. A camera is allocated to each square in the grid, by a process of random generation of latitude and longitude. The locations are then programmed into hand-held GPS units, and field teams then travel to the locations by foot.



On reaching the camera site as designated by the GPS unit, the team selects the best location for the placement of a camera, within 100 meters of the exact latitude and longitude as randomly generated by computer. The remote camera is deployed to standard specifications, and programmed to monitor the region over a 24-hour period. Cameras remain in the field for 2 weeks before they are checked and removed by the field teams. Films are developed, and data from the camera loggers downloaded to a computer for analysis.

Whilst setting up and maintaining the remote cameras the field teams are actively involved in the census of secondary signs encountered in the field. Teams look for secondary signs that indicate the presence and abundance of tigers, their prey and human intruders. Other data collected during these field surveys include characteristics of habitat, hydrology and topography. These observations are mapped using GPS, integrated with GIS maps by the downloading of latitude/longitude data on exit from the field.

During this quarter a rapid evaluation trial was conducted in Plang Ijo resort of Way Kambas National Park (see GIS map above - Zone 3). To date three trials have been carried out in Way Kambas National Park, and it is proposed that the technique will be expanded to areas outside the park in the near future. Work will be carried out with the cooperation of local PHPA staff, and will utilize rangers familiar with the survey region. This status evaluation will also provide a further opportunity to train and facilitate PHPA staff in tiger-range areas outside of Way Kambas National Park.

This work will commence as soon as local counterparts and permits have been established, and as soon as the necessary funding has been secured. Preliminary trials will continue to be used as an opportunity to refine techniques. This will be repeated to the point where it is considered that methodologies are appropriate for a range of habitat conditions, replicable over most of Sumatra, and achievable by independent PHPA ranger teams operating in their own regions of responsibility.

Project Plans for Next Quarter: July 1997 to September 1997

The next quarter's priority is to try to launch the first Tiger Conservation Team to begin the process of assessing tiger status across all of Sumatra. As a first step in this program, the Tiger Conservation Team will be given the task of surveying all the potential tiger habitats in Lampung Province. Following the success of this the project will extend its operations to other provinces of Sumatra.

The Tiger Conservation Team will consist of members of the Sumatran Tiger Project, the PHPA and local university students. The teams will operate under the guidance of the STP base-camp in Way Kambas and will respond to direct requests for information from the PHPA.

COMMUNITY-BASED CONSERVATION PROGRAM

Progress Report: April 1997 to June 1997

Submitted by Sumianto, Staff, Community-Based Conservation Program and Philip Nyhus, Coordinator, Community-Based Conservation Program

The Community-Based Conservation Program (CCP) of the Sumatran Tiger Project is based upon recommendations set forth in the *Indonesian Sumatran Tiger Conservation Strategy* published in 1994 by the Indonesian Directorate General of Forest Protection and Nature Conservation (PHPA), Ministry of Forestry. This strategy formally outlines the steps necessary to develop and sustain a conservation program that will ensure the long-term viability of wild Sumatran tigers in Indonesia. The CCP addresses the critical human component of this strategy and is one of the projects which comprise the *in situ* component of the Sumatran Tiger Project.

The goal of this program is to better understand park-people interactions near Way Kambas National Park (WKNP). Evaluating human resource use patterns and wildlife resource needs is an important step to establish criteria to resolve future conflicts between tiger populations and human settlements in this and other tiger protected areas in Sumatera.

Field Phase: April 1997 to June 1997

The Community-Based Conservation Program (CCP) was initiated in December, 1995. This report contains the second quarter of the second year of this program (sixth quarter since inception). The primary objectives of this quarter of field work in villages bordering Taman Nasional Way Kambas were:

- to complete quantitative village surveys in villages surrounding TNWK and to continue data entry of data from 1996 in order to study land use, attitudes, and human-wildlife conflicts in communities near the park;
- to continue to monitor the extent and frequency of human-wildlife conflicts;
- to continue mapping existing research sites and to collect demographic information; and
- to prepare for education and awareness programs scheduled to begin in July 1997.

Village Surveys

The Sumatran Tiger Project *Survey Desa 1996-97* was completed during this quarter. Since its inception, close to 1,000 questionnaires were completed from 14 villages. The 12-page survey consists of four major sections: 1) background information; 2) land and resource use inside and outside the park; 3) human wildlife conflicts; and 4) knowledge and attitudes about wildlife (particularly tigers), WKNP, and PHPA activities. Animal photos taken by STP cameras also were used to study the awareness of villagers about tigers and other park wildlife.

A database was created using SPSS statistical software to permit analysis of the questionnaire results. During this quarter, data entry was completed from the following three villages: Braja Yekti (Kecamatan Way Jepara), Muara Jaya (Kecamatan Sukadana), and Tanjung Tirta (Kecamatan Purbolinggo). For details about the survey instrument and survey methods, please see the previous progress reports. To date, data entry for the *Survey Desa 1996-97* was completed in the following villages:

<u>Kecamatan/Desa</u>	<u>Completed Data Entry</u>
<u>Kecamatan Way Jepara/Braja Yekti</u>	88
<u>Kecamatan Sukadana/Muara Jaya</u>	76
<u>Kecamatan Purbolinggo/Tanjung Tirta</u>	94
<i>TOTAL completed data entry this quarter</i>	258

Conservation Education Activities

Funds from the United States Fish and Wildlife Service Rhinoceros and Tiger Conservation Fund were received for community-based conservation and education activities at Way Kambas during 1997-98. Before traveling to Indonesia, Nyhus held two separate meetings with Gary Westby, representative of the Minnesota Conservation Officers Association (MCOA), and representatives of three different schools regarding joint activities to encourage communication between schools in Minnesota and schools near Way Kambas. Plans were made to host several visitors from MCOA at Way Kambas in mid-July. After arriving in Indonesia, Nyhus also met representative of WWF-Indonesia Programme in Jakarta to discuss their experiences with education programs in Sumatra.

In Indonesia, Sumianto made arrangements with representatives of several schools near the southern border of the park for the planned July meetings. Sumianto also discussed the possibility of arranging a meeting with several village leaders, including the *kepala desa* of Karang Anyar (Darto), Braja Harjosari (Sumadi), Braja Yekti (Rawan), Labuhan Ratu VI (Kaijo), Rantau Jaya Udik II (Kasiyan), Muara Jaya (Mulyono), Tegal Yoso (Rasidi), and Tanjung Tirta (Maehan).

Nyhus and Tilson completed a brochure about tigers and the important role of zoos in tiger conservation for the Indonesian Zoological Parks Association (Perhimpunan Kebun Binatang Se-Indonesia, PKBSI) (copy attached). This brochure will be used as a model for future education materials to be developed during the next quarter.

Presentations

Along with staff from the Field Ecology Program and Dr. Tilson, Sumianto presented a summary of the first year of the Community Conservation and Education Program at Way Kambas

National Park at the Sumatran Tiger Masterplan Workshop for the Indonesian Zoological Parks Association (PKBSI) at Taman Safari Indonesia, Cisarua, West Java (2-3 April 1997).

In the United States, Nyhus presented a slide show about the Sumatran Tiger Project to students from Macalaster College, Minnesota; representatives of three Minnesota schools and the Minnesota Conservation Officers Association; and was interviewed about the project for a local radio station.

Human-Wildlife Conflict

Sumianto continued to collect human-wildlife conflict data sheets from 13 different villages along the southern and southwestern borders of the park. These data sheets document the date, type of animal, number of individuals, location, time, and crop damage from animals leaving Way Kambas (see attached example). These data are collected by informants in each target village with the goal to provide information on how many animals leave the park, where they leave the park, damage from these animals, and relationships to cropping cycles, seasonal patterns, border types and other relevant factors.

Additional newspaper articles were collected from the KOMPAS documentation and archives office in Jakarta and an STP archive system was started for Lampung Post and Jakarta Post newspapers. A database format was developed to start collating information about tiger conflicts and other wildlife information for all of Sumatra based on these articles over an approximately 10-year time period. Nyhus also arranged for the Pusat Dokumentasi dan Informasi Manggala Wanabakti to search for material in their archives on tigers and protected areas in Sumatra.

Human Dimension of Tiger Conservation

Nyhus was invited to participate in a workshop hosted by the Conservation Breeding Specialist Group (CBSG) of the World Conservation Union (IUCN) and funded by the SSHRC of Canada to share STP's experiences developing a range of qualitative and quantitative methods to study threats to wildlife and protected areas. The goal of this meeting was to discuss strategies to include the human dimension into existing CBSG Population and Habitat Viability Analysis (PHVA) workshops. Workshop participants expressed considerable interest in using the Sumatran tiger as a model for a future PHVA workshops in Indonesia.

LIPI

A formal proposal was submitted to Lembaga Ilmu Pengetahuan Indonesia (LIPI, the Indonesian Institute of Sciences) for Nyhus to conduct research in Indonesia during 1997-98. Supporting letters were included from Taman Safari Indonesia (TSI), Indonesian Ministry of Forestry's Department of Forest Protection and Nature Conservation (PHPA), the Minnesota Zoo, and the University of Wisconsin--Madison.

GIS Activities

We continued to use a Garmin 45 Global Positioning System (GPS) hand-held unit to create maps of areas along the border of the park. Data were collected on motorcycle, vehicle, or foot, and boat, depending on the terrain. Waypoint information was marked on existing map and data

downloaded into a computer with PCX5 software for later inclusion into the STP Geographic Information System (GIS) map. As of March 1997, all major roads in the six *kecamatan* surrounding Way Kambas, the park border from Plang Ijo to Muara Jaya to Cabang, and most of the major villages bordering the park have been mapped.

During this quarter, Nyhus and Tilson met with Bruce Epler, Accounts Manager, Midwest Territory, for ERDAS, Inc. and Ben Drake, a remote sensing consultant for ERDAS, to discuss applications of ERDAS software to STP's tiger conservation efforts. Letters were written to SPOT, Landsat, and Radarsat corporations on behalf of the Sumatran Tiger Project to request assistance in obtaining satellite imagery of Way Kambas National Park and other protected areas in southern Sumatra. Information about available images was also received from LAPAN, the Indonesian Remote Sensing Applications Center.

The following software was received through generous contributions from ERDAS, Inc.:

- ERDAS Imagine
- Topix Space Imaging
- MapSheets

The following software was received through a grant from the Conservation Grants Program of the Environmental Systems Research Institute (ESRI), Inc.:

- ArcView GIS v3.0a (2)
- ADCW for ESRI desktop software
- ArcView GIS Spatial Analyst v1.0a (2)
- ArcWorld 1:3m R10
- Atlas GIS Win v3.x to 3.03 upgrade
- ArcAtlas: Our Earth Package

Summary of Community-Based Conservation Activities: April 1997 to June 1997

The following major activities were undertaken by the Community-Based Conservation Program of the Sumatran Tiger Project through June 1997:

- Field work for the 12-page *Sumatran Tiger Project Survey Desa 1996-97* was completed. Data entry was completed for three villages and is on-going.
- Human-wildlife conflict logs continue to be collected from informants in 13 villages.
- GIS and remote sensing software was received for use by the STP. Contacts were made to obtain satellite imagery of Way Kambas National Park and other areas in southern Sumatra.
- Community education program planning was started.

Project Plans for Next Quarter: July 1997 to September 1997

Community education and awareness activities will commence in selected villages near Way Kambas. STP plans to work with PHPA and representatives of the US-based Minnesota Conservation Officers Association (MCOA) to carry out initial program activities. Data entry will continue on the 1996 field data and scholarly papers will be prepared. We intend to acquire one Landsat image of Way Kambas National Park and Nyhus will undertake one week of intensive satellite image interpretation training at Erdas, Inc. headquarters in Atlanta, Georgia.

Recipients of Project Report and Acknowledgements

This report constitutes the fourth quarter progress report of the second year as required by LIPI for researchers in Indonesia. Six copies are presented to the Head of the Bureau of S&T Cooperation in Jakarta. In addition, copies of this report have been mailed to collaborating and sponsoring institutions, both within and outside of Indonesia.

Ari Budiman, Director, Indonesian Institute of Sciences (LIPI), Bogor
Soehartono Soedargo, Head, Bureau of S&T Cooperation, LIPI, Jakarta
Eddy Bambang Prasetyo, Research & Development Center for Biology (LIPI), Bogor
Djamaludin Suryohadikusumo, Minister of Forestry, Jakarta
Soemarsono, Director General of PHPA, Jakarta
Dwiatmo Siswomartono, Director of Flora, Fauna & Nature Conservation, PHPA, Jakarta
Johannes Subijanto, Sub-Directorate of Species Conservation, PHPA, Jakarta
Effendy Sumardja, Ministry of State for Population and the Environment, Jakarta
Jansen Manansang, Taman Safari Indonesia, Cisarua
Jatna Supriatna, Universitas Indonesia, Depok
Widodo Ramono, Dinas Kehutanan, Di Aceh, Sumatra Utara

Pudjono, Governor of Lampung Province, Lampung
Eko Wardoyo, Kakanwil, Lampung
Harjanto Wahyu Sukotjo, KSDA II, Lampung
Suherti Reddy GT, Sub-BKSDA Way Kambas, Lampung Tengah
Alhusniduki Hamim, Rector, Universitas Lampung (UNILA)
Muhajir Utomo, Soil Management/Research Director, UNILA

Save the Tiger Fund Council members:

John Seidensticker, Chairman, National Zoo, Washington, DC
Ulysses Seal, IUCN Conservation Breeding Specialist Group, Apple Valley, MN
Amos Eno, National Fish and Wildlife Foundation, Washington, D.C
Sydney Butler, American Zoo and Aquarium Association, Bethesda, MD
Marshall Jones, U.S. Fish and Wildlife Service, Washington, DC
Mohd. Khan, IUCN Rhino Specialist Group, Kuala Lumpur, Malaysia
Lee Simmons, Henry Doorly Zoo, Omaha, NE
Edward Ahnert, Exxon Corporation, Dallas, TX
Peter Jackson, IUCN Cat Specialist Group, Gland, Switzerland
Mel Sunquist, University of Florida, Gainesville, FL
Colin Rees, World Bank

Whitney Tilt, National Fish and Wildlife Foundation, Washington, DC
Nancy Sherman, Exxon Corporation, Dallas
William Young, Exxon International, Florham Park
Bung Hutabarat, ESSO Indonesia, Jakarta
Denise Fennell, ESSO U.K., London

Anne-Marie Alden/Janet Tilson, Tiger Information Center, USA
Maurice Hornocker/Howard Quigley, Hornocker Wildlife Research Institute, USA
Josh Ginsburg/John Robinson, NYZS Wildlife Conservation Park, USA
Gerald Brady, AZA Sumatran Tiger SSP Coordinator, USA
Sarah Christie, EEP Tiger Coordinator, UK
David Pepper-Edwards, ASMP Tiger Coordinator, Australia
Jeremy Searle, York University, UK
Michael Adams, University of Wisconsin-Madison, USA
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With this quarterly report, we are pleased to announce the beginning of a new conservation partnership between the Sumatran Tiger Project and the Zoological Society of London (ZSL) through the London Zoo. ZSL will be supporting the development of the first Tiger Conservation Team to operate in Indonesia.

SUSUNAN ACARA RAPAT MASTERPLAN HARIMAU SUMATERA
2 - 3 APRIL 1997

Rabu, 2 April 1997

- 08.30 : Pendaftaran peserta
- 09.00 -10.00 : Pembukaan workshop diawali dengan sambutan-sambutan
- Koordinator Regional Harimau Sumatera, Jansen Manansang
 - Global Koordinator Harimau, Ron Tilson
 - Ketua Umum PKBSI, Lukito Daryadi
 - Pembukaan Rapat Masterplan Harimau Sumatera oleh Bapak Soemarsono, Dirjen PHPA
- 10.00 - 10.15 : Rehat
- 10.15 - 12.00 : Perkenalan peserta Rapat Masterplan
- Strategi Konservasi Harimau Sumatera oleh Bapak Dwiatmo Siswomartono
 - Komponen Proyek Harimau Sumatera in-situ dan ek-situ oleh Bapak Ron Tilson
- 12.00 - 13.00 : Makan siang
- 13.00 - 14.10 : Over view singkat oleh :
- Doug Armstrong : Kesehatan Harimau
 - Gerald Brady : Studi Genetik DNA Harimau Sumatera
 - Ligaya Tumbelaka : Studbook Harimau Sumatera PKBSI
 - Gerald Brady : Status Harimau Sumatera di Amerika Utara
 - Sarah Christie : Status Harimau Sumatera di Eropa
 - David. P. Edward : Status Harimau Sumatera di Australia
 - Jansen M. & Atje S. : Status Harimau Sumatera di Indonesia
- 14.10 - 15.00 Rekomendasi awal pengelolaan Harimau Sumatera oleh G. Brady & K. Traylor-Holzer
Penangkaran dan transfer harimau Sumatera di PKBSI oleh PKBSI
- 15.00 - 15.15 R e h a t
- 15.15 - 17.00 : Diskusi antara anggota PKBSI
- 17.00 - 19.00 : Istirahat dan makan malam
- 19.00 - selesai : Presentasi Proyek Penyelamatan Harimau Sumatera oleh Sriyanto, Bastony dan Neil Franklin.

Kamis, 3 April 1997

- 07.30 - 09.45 : Pembahasan kembali draft rekomendasi PKBSI
Penyelesaian rekomendasi masterplan (Pedoman Induk) PKBSI
- 09.45 - 10.00 : Rehat
- 10.00 - 12.00 : Mengintegrasikan rekomendasi PKBSI dengan program regional lainnya
Pembahasan ulang Program Genome Resource Bank Harimau Sumatera PKBSI
Diskusi pembentukan Tim Penyelamatan Harimau yang bermasalah di Sumatera
- 12.00 - 13.00 : Makan Siang
- 13.00 - 14.45 : Penyempurnaan Permasalahan Harimau Sumatera di Indonesia oleh PKBSI
Presentasi : Sumbangan Kandang transportasi Harimau oleh ARAZPA
- 14.45 - 15.00 : Rehat
- 15.00 - selesai : Sumbangan dana untuk transfer Harimau Sumatera antar Kebun binatang di Indonesia oleh London zoo.
Presentasi : Sumbangan Materi Pendidikan Konservasi oleh ARAZPA
Presentasi : Pengadaan perlengkapan immobilisasi Harimau Sumatera untuk dokter hewan dan direktur KB PKBSI melalui TSI.

PKBSI Sumatran Tiger Masterplan

2 - 3 April 1997, Taman Safari Indonesia

In order to effectively manage an endangered species such as the Sumatran tiger in captivity, institutions maintaining these animals must work together to manage them as one large interbreeding population. This requires a comprehensive action plan based upon the analysis of the population and developed by the institutions that will implement it.

This masterplan is that action plan for the Sumatran tiger in PKBSI zoos. It is based upon a studbook database developed and maintained by Ligaya Tumbelaka, PKBSI Sumatran Tiger Studbook Keeper at Taman Safari Indonesia/Bogor Agriculture University. Components of this masterplan include: genetic and demographic population analyses performed by Peter Christie, Western Plains Zoo, Australia in 1995 and Kathy Traylor-Holzer, Minnesota Zoo, USA in 1997; and population goals, management strategies and breeding recommendations discussed and developed by the PKBSI Sumatran Tiger Management Committee in April 1997.

Recommendations for population management set forth in this masterplan will be coordinated by the two program co-coordinators, Jansen Manansang, Taman Safari Indonesia, and Atje Salfifi, Ragunan Zoo. Implementation is the responsibility of the Sumatran Tiger Management Committee composed of representatives from each of the ten PKBSI zoos maintaining Sumatran tigers: Kebun Binatang Ragunan, Taman Safari Indonesia, Kebun Binatang Bandung, Gembira Loka-Yogyakarta, Timjomoyo Semarang, Satwa Taru Surakarta, Kebun Binatang Surabaya, Griya Satwa Mulya-Medan, Kebun Binatang Jambi, and Kebun Binatang Bukittinggi. Additional recommendations on related issues such as veterinary medicine, husbandry and genome resource banking were made by members of the visiting Sumatran Tiger Project Team in 1995 and follow the masterplan (see Section 3).

In 1994 the Ministry of Forestry, Directorate General of Forest Protection and Nature Conservation (PHPA) developed the *Indonesian Sumatran Tiger Conservation Strategy* outlining a conservation program for Sumatran tigers in Indonesia. The objectives of this strategy are to ensure the long-term viability of wild Sumatran tigers in major protected areas of Sumatra, to develop a captive management program for Sumatran tigers in PKBSI zoos, and to link these *in situ* and *ex situ* conservation activities for the reinforcement and recovery of wild populations as part of the IUCN/SSC CBSG *Tiger Global Conservation Strategy*. The *PKBSI Indonesian Sumatran Tiger Masterplan* supports these objectives and is an integral component of this multi-faceted program to conserve the Sumatran Tiger.

Program Goals

The *Tiger Global Conservation Strategy* recommends the maintenance of a world captive population of at least 250 Sumatran tigers managed in four regional programs (see Section 1). These tigers should be managed in such a way as to retain a minimum of 90% of the original

genetic diversity acquired from the wild for at least 100 years. The PKBSI Sumatran tiger program is a critical component of this global program. As the range country program, it holds the primary responsibility for preservation of this subspecies in captivity and is the link through which new genetic founders will enter the global captive population.

The goal of the PKBSI Sumatran tiger program is to retain at least 90% of the genetic diversity obtained from the wild for 100 years. The population is currently at carrying capacity with 61 tigers. Based upon calculations using the CAPACITY computer software program, this goal of 90% retention could not be attained with such a relatively small population size without additional founders contributing to the program. The incorporation of more wild-caught founders into the breeding program (either by breeding those already in captivity or through "problem" tigers captured from the wild) will be necessary for the success of the program.

Since the population is currently at carrying capacity, population growth must remain stable, with births and captures balancing deaths and exports unless additional cage spaces are added. The rate of acquisition of problem tigers and the level of exportation of non-breeding tigers to other regional programs will determine the birth rate and annual number of breeding recommendations that can be made within the PKBSI.

Status of Managed Population

Current Inventory

One of the first priorities for the establishment of a managed program is to develop an accurate studbook database for all animals living in captivity within the region. These data can then be used in genetic and demographic analyses to determine the potential importance of each individual animal to the breeding program. Often animals previously thought to be valuable become less valuable after analysis. Reasons for this may include incomplete pedigree, unverified origin, identity confusion, health and reproductive problems, and abundance of relatives in the population.

The PKBSI Sumatran Tiger Regional Studbook is maintained by Ligaya Tumbelaka and is based on information and records supplied by the PKBSI zoos. This studbook database was updated prior to the masterplan meeting and used in the following analyses of the PKBSI Sumatran tiger captive population (see Appendix for studbook report for the living population).

As of 1 April 1997 there are 61 Sumatran tigers (32 males, 29 females) maintained within 10 PKBSI zoos (see Table 1). Of these, 18 (10 males, 8 females) are believed to be wild-caught and the remaining 43 (22 males, 21 females) tigers are captive-born.

The PKBSI Sumatran tiger management committee did not officially designate any of the tigers currently in the population as surplus to the breeding program; therefore, the subsequent analyses include all of the 61 tigers in PKBSI zoos. Criteria to review when considering designating an animal as "surplus" to the genetic and demographic needs of the program include age, health and reproductive status, known pedigree and origin, and representation of founder lines in the population. There may be some individual tigers that will never breed in the future

Table 1. Current status of PKBSI Sumatran tiger population [# males.# females.total#].

PKBSI Zoo	# Wild-caught tigers	# Captive-born tigers	Total # of tigers
Bandung	0.0 (0)	1.1 (2)	1.1 (2)
Bukittinggi	0.0 (0)	1.1 (2)	1.1 (2)
Jambi	0.0 (0)	1.1 (2)	1.1 (2)
Medan	0.1 (1)	1.0 (1)	1.1 (2)
Ragunan	1.0 (1)	7.3 (10)	8.3 (11)
Semarang	0.1 (1)	1.0 (1)	1.1 (2)
Solo	0.0 (0)	1.1 (2)	1.1 (2)
Surabaya	1.1 (2)	4.6 (10)	5.7 (12)
Taman Safari	8.5 (13)	3.4 (7)	11.9 (20)
Yogyakarta	0.0 (0)	2.4 (6)	2.4 (6)
Total	10.8 (18)	22.21 (43)	32.29 (61)

due to one or more of these factors. It is desirable to remove these animals from the computer analysis in order to get an accurate view of the status of the tiger population.

Verification of Wild-Caught Tigers

It is best to take a conservative approach when including animals as founders in a managed captive program. Individual animals of undocumented or questionable origin should be excluded from the breeding program until their origin can be verified. This is particularly relevant in situations such as the PKBSI Sumatran tiger program when new founders are likely to become available (e.g., captured problem tigers).

Ten male and eight female Sumatran tigers in the PKBSI population are reputed to be wild-caught in origin (see Table 2). Written documentation of the origin of six individuals (four males, two females) was available at the 1995 PKBSI Masterplan workshop. Documentation for a newly captured female currently held at Medan Zoo was available at this 1997 Masterplan workshop. Documentation is reported to be available for an additional male and female (both at Surabaya) which needs to be submitted immediately to the PKBSI Sumatran Tiger Studbook Keeper and CBSG Tiger Global Coordinator.

Of the remaining nine tigers of unverified origin, five (4.1) have been verified as Sumatran tigers through recent molecular DNA analysis conducted by Stephen O'Brien in the U.S. These tigers are therefore known to be of the Sumatran subspecies, but their origin has not been verified as wild-caught. One additional female (SB# 873) has never reproduced and is too old to breed, so her origin is irrelevant. Verification of the remaining reputed three wild-caught tigers (SB# T9621, T9622 and T9625 at TSI) needs to be pursued immediately; if written documentation or other sources of information are not available, DNA samples from these tigers should be analyzed for subspecies verification.

Table 2. Verification and reproductive history of wild-caught Sumatran tigers in PKBSI zoos.

SB#	Name	Sex	Age	Location	Verification	Reproductive history
866	Hendra	M	9+	TSI	Verified as wild-caught	2.3 offspring; all dead
867	Galuh	M	10	TSI	Sib to SB 868, DNA verified	1.3 living offspring
868	Ago	M	10	TSI	DNA verified as Sumatran	No offspring
870	Bagira	M	9+	TSI	Verified as wild-caught	No offspring
871	Bokir	M	9+	TSI	DNA verified as Sumatran	No offspring
872	Bukit	M	6+	TSI	Verified as wild-caught	No offspring
874	Medan	M	10+	TSI	Verified as wild-caught	Breedings produced no pregnancy/ possibly sterile
885	Kulu	M	6+	Ragunan	DNA verified as Sumatran	No offspring
T9615	Ujang	M	3+	Surabaya	Documentation pending	No offspring
T9625	Simba	M	3+	TSI	Unverified	No offspring
869	Tera	F	8+	TSI	Verified as wild-caught	2.3 offspring; all dead
873	Elis	F	26+	TSI	Unverified	No offspring/ too old
884	Manis	F	14+	Semarang	DNA verified as Sumatran	0.1 offspring; dead
908	Deli	F	11+	Surabaya	Documentation pending	12 (5.7) living descendants
T9590	Cane	F	5	TSI	Verified as wild-caught	No offspring
T9621	Lady	F	?	TSI	Unverified	No offspring
T9622	Tari	F	?	TSI	Unverified	No offspring
T9629	Tele	F	?	Medan	Verified as wild-caught	No offspring

Genetic Analyses

Information on the Sumatran tiger population contained in the studbook was analyzed using the GENES computer software program developed by Robert Lacy. This program models the passing of genetic material (alleles) through the population and allows the assessment of the genetic status of the population based upon the breedings that have already occurred in captivity. The resulting genetic summary is based upon the descendant (captive-born) population. Wild-caught tigers are not considered to have contributed to the population until they reproduce and leave surviving offspring that carry their genetic background. It is therefore important that wild-caught animals reproduce so that they can serve as new founders to the captive population.

Wild-caught individuals are assumed to be unrelated to each other unless there is evidence otherwise. Two of the wild-caught males currently at Taman Safari (SB# 867 and 868) were obtained together as cubs of the same age and were assumed to be siblings for these analyses. In this case, their wild parents are considered founders (WILD1 and WILD2) rather than the cubs themselves.

Founder Representation

The management strategy that preserves the most genetic diversity in the captive population is to keep the representation of each of the founder lines as equal as possible. Ideally, each founder should produce the same number of offspring over its lifetime. Realistically, this is seldom possible and has not been done in the past. The task of the management committee of a newly

established managed captive program is to assess the current founder representation in the population and to equalize it as much as possible. This means breeding new founders or those with few offspring or relatives in the population while suspending reproduction in individuals related to overrepresented founders.

The descendant PKBSI Sumatran tiger population is currently based upon 16 founders. Of these 16 founders, only one remains in the PKBSI tiger program (female SB# 908), with two sibling wild-caught males representing another two wild founders not in captivity. The remaining 13 founders are dead and are represented through their captive-born descendants.

Among these 16 existing founder genetic lines, representation is unequal. Most notably, founders 371 ♂ and 370 ♀ bred at Ragunan Zoo represent over 54% of the genetic background of the entire PKBSI Sumatran tiger descendant population (see Fig. 1). For comparison, if representation were equal among the 16 founders, two founders would represent only 12.5%.

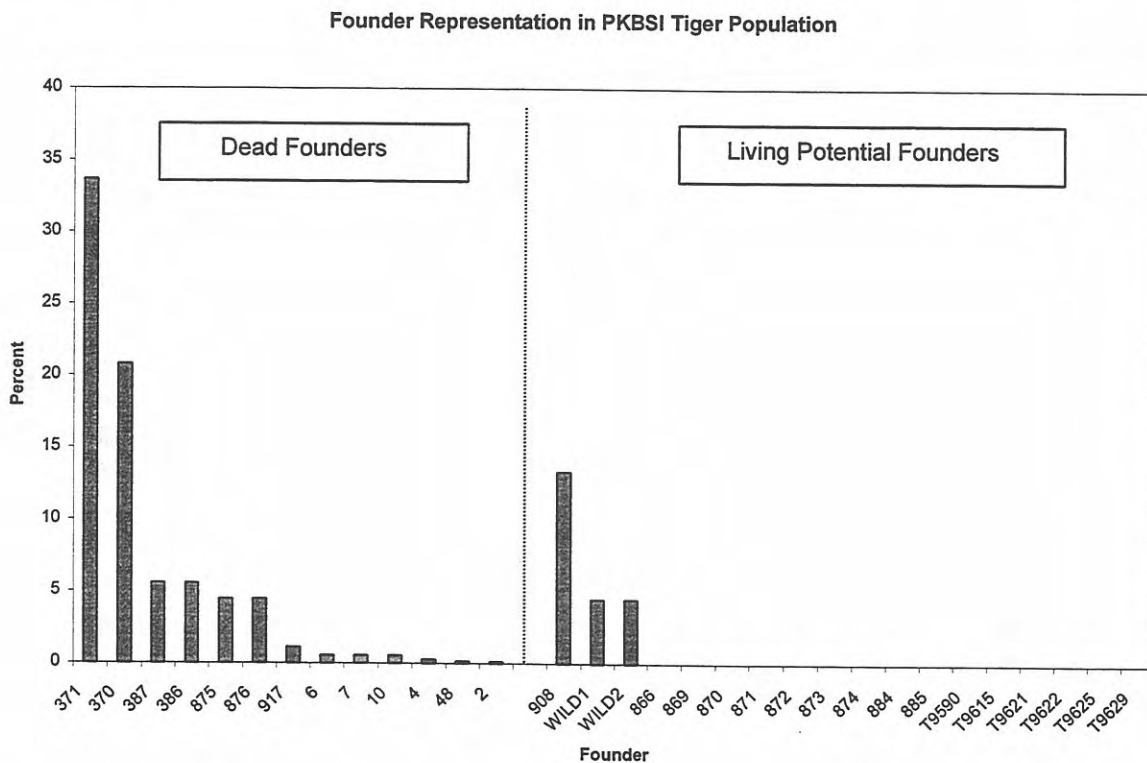


Fig 1. Founder representation in the descendant PKBSI Sumatran tiger population.

Only two of the living wild-caught tigers in the PKBSI tiger program have living offspring. Male SB# 867 has four offspring (all currently at TSI); these four tigers are also the only living descendants of the TSI founder lines SB# 875 and 876 which are still of reproductive age (Fig. 2). Therefore, these four offspring represent four founders (SB# 875, 876, WILD1 and WILD2). Female SB# 908 has 12 living descendants, all crossed with the overrepresented Ragunan founder line (SB# 370 and 371) (Fig. 2).

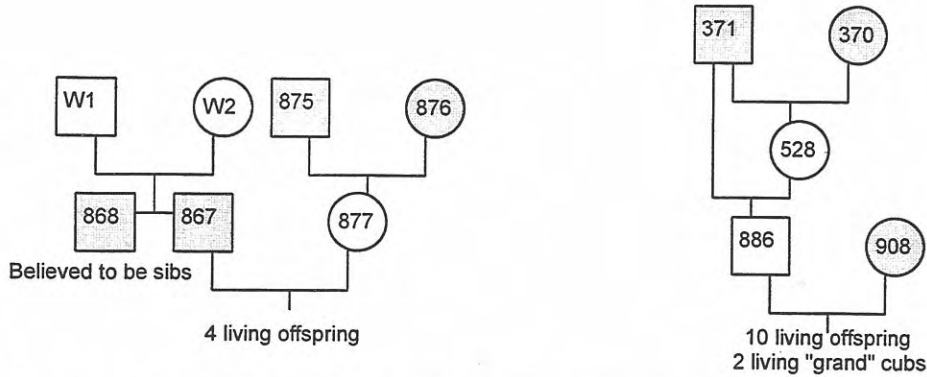


Fig. 2. Pedigree of two living possibly wild-caught tigers which have living offspring (shaded boxes are wild-caught tigers; W1=WILD1; W2=WILD2).

Unequal representation means that only a very small portion of the genetic material has been retained for many of the founders. Therefore, although 16 founder lines contribute to the captive-born population, this is equivalent to only 3.7 founder lines (founder genome equivalents). In other words, the genetic composition of the population is similar to one based upon 3.7 founders that contributed equal numbers of surviving offspring. It is important to discontinue breeding over-represented founder lines such as the SB# 370/371 line and to increase efforts to breed under-represented founders and their descendants

Up to 15 additional potential founders comprise the PKBSI tiger population as wild-caught tigers that have no living offspring, bringing the possible total to 31 founders. As there is little information available regarding the capture of these individuals, age is unknown for most of them. Ages presented in Table 2 represent minimal age estimates based upon animals being approximately one year of age when transferred to an Indonesian zoo. It is therefore difficult to assess whether many of these tigers are still of reproductive age. Even given these minimum ages, it is evident that several of these tigers may be approaching the end of their reproductive lifespan and attempts should be made to breed these tigers as quickly as possible.

Genetic Diversity

A gene drop analysis using the GENES software program was performed on the current PKBSI tiger population of 61 tigers, assuming all tigers are verified, all wild-caught tigers are unrelated (except for the pair of male siblings), and all pedigrees based on zoo records are correct. This analysis suggests that the population currently retains only 86.5% of the original genetic diversity from the wild. This is below the target goal of retaining 90% genetic diversity.

Gene diversity generally decreases in a captive population unless new genetic lines are introduced and bred sufficiently. If the wild-caught founders currently in the tiger program were bred optimally, the potential amount of genetic diversity that could be retained is 97.9%. Under such management, the number of founder genome equivalents would increase from 3.7 to 23.3. Since we cannot control variable factors such as fertility and litter size, "perfect" management is not achievable; however, this analysis demonstrates the potential benefits of a more effective and comprehensive breeding program. As additional "problem" tigers enter the captive population as new founders, it will be possible to continue to maintain a high percent of genetic diversity in the program.

Inbreeding

Inbreeding, or the breeding of related animals, results in a loss of genetic diversity in the population and can also be associated with physiological and morphological problems such as reduced fertility and high neonatal mortality. Inbreeding cannot always be avoided in a small captive population, but it is desirable to minimize inbreeding when possible. Inbreeding is measured by the inbreeding coefficient F , with $F=0$ indicating that the animal's parents are unrelated. In comparison, offspring of a father-daughter or brother-sister mating would have an $F=0.25$.

Overall there is a relatively low level of inbreeding in the PKBSI tiger population, with the average $F = 0.082$. For 46 of the 61 tigers, there is no inbreeding ($F=0$). One tiger imported from Europe (SB# 543) is slightly inbred ($F=0.125$). Twelve tigers have an $F=0.25$, all of which are from the SB# 370/371 genetic line. Two tigers have an $F=0.2812$ (SB# T9600 and T9601) and are a cross between the 370/371 line and the SB# 908 line. Since these tigers are from overrepresented lines, they should not be bred within the PKBSI population and should definitely not be bred to each other, which would result in further inbreeding.

Mean Kinship

Determining good genetic pairs of tigers for breeding that would equalize founder representation is not always simple. The GENES analysis aids in these decisions by calculating a measurement for each animal called mean kinship, which measures how related each animal is to the rest of the descendant population. The GENES program produces a list of living animals ranked according to mean kinship, with males in the left column and females in the right. The animals with the lowest mean kinship value are at the top of the list. These animals are the least related to others in the population and are therefore the most valuable animals to breed. The mean kinship list is a very valuable tool in determining the most genetically valuable animals in the population.

The mean kinship list in Figure 3 emphasizes the value of potential founders to the PKBSI program that have not yet bred. These individuals, representing the top eight males and top seven females, have a mean kinship value of 0, indicating that they have no relatives in the population. Descendants of overrepresented lines are found nearer the bottom of the list.

The mean kinship of an animal changes each time it (or any of its relatives) produce offspring, or when any of its relatives die or leave the population. It is therefore important that the studbook be kept current and that an analysis is performed on the current population prior to making breeding recommendations. Declaring an animal "surplus" also removes it from the analysis and affects the rankings of the remaining animals. For instance, the SB# 908 founder line is well-represented with 12 descendants (see Fig. 2), decreasing the breeding value of wild-caught female 908. However, all of 908's descendants also contain the 370/371 founder lines. If these tigers were declared surplus to the program, then 908's mean kinship value would become 0 and she would be considered a highly valuable female to breed.

Demographic Analyses

Population Census

A census of the Sumatran tiger population in the ten PKBSI zoos based on the studbook data show a steady increase in the population starting in 1966 up until 1994, when the population leveled off at about 60 tigers (Fig. 4). The average annual growth rate over the last 30 years has been about 15% ($\lambda = 1.15$). Growth in the last five years since the establishment of the PKBSI Sumatran tiger program has averaged 7% annually. No growth was observed between 1994-1996 due to the suspension of breeding attempts pending DNA analysis and related verification issues.

Fecundity and Mortality

Based on past PKBSI zoo records the primary reproductive span for female Sumatran tigers is during 3-12 years of age, with a peak around eight years. Males are primarily reproductive between 4-10 years of age, peaking around 7-8 years. This information is based upon how the tigers were managed and bred in the past and only suggest the reproductive lifespan and capabilities of the subspecies. The average generation time is about seven years.

Litter sizes range from 1-5, with an average of 2.6 cubs per litter. Neonatal mortality within the first 30 days of birth is 25% (22 out of 88 births). Of those tigers that survive the first few months after birth, most live to at least 10-13 years of age. Mortality rates increase steadily after 14 years of age, with few tigers living to be 20 years old.

Population Age Structure

The majority ($n=45$) of the tigers currently in the PKBSI program are of breeding age (i.e., 3-11 years old). There are only five tigers under three years old due to the breeding suspension of the last two years. Since there are a sufficient number of breeding age animals, it will not be difficult to produce enough cubs in the next several years to keep the population from declining as the breeders age.

Population Dynamics

The size of the population is determined by the rate at which tigers enter and leave the population. Tigers can enter the PKBSI program in three ways: through births in the captive population, through transfer of wild-caught problem tigers or acquisition of similar wild-caught tigers within Indonesia, or through importation of tigers from other countries. There is no need for the PKBSI program to import tigers, so only births and acquisition of wild-caught animals will be considered. Tigers can also leave the program in three ways: through death, transfer to a non-PKBSI facility in Indonesia, or exportation to another tiger regional program.

The PKBSI Sumatran tiger program currently has a capacity of about 60 tigers. This means that the population needs to be managed for no growth, with the number of tigers entering the program balancing the number of tigers leaving the program. If additional cage spaces are created by construction of new facilities and/or conversion of other exhibits (e.g., Siberian or Bengal tiger exhibits) into additional spaces for Sumatran tigers, then population growth can be allowed until the program once again reaches carrying capacity.

Over the last six years, the average number of adult deaths in the PKBSI tiger population has been about two tigers per year. One additional tiger per year has been transferred to a non-PKBSI facility within Indonesia. No exportations have taken place. Therefore the average rate of loss of adult tigers from the population has been about three tigers per year.

About one wild-caught tiger has entered the program each year during this same period. If this rate continues, then only about two surviving cubs can enter the program each year in order to keep the population size stable. Given an average litter size of 2.6 cubs and 25% neonatal mortality, this suggests only one litter should be produced on average each year to prevent further population growth.

Not every breeding recommendation made by the PKBSI Sumatran tiger management committee is likely to produce a litter. Success rate is dependent upon factors such as compliance rate on relocating tigers from one zoo to another and age, health, fertility and compatibility of the tigers. In the North American Tiger SSP, only about 50-70% of breeding recommendations results in a litter being produced. This success rate may be different for Indonesia, but it suggests that two breeding recommendations would result in one litter of cubs.

Many factors may affect this population balance. For instance, as the current population ages, adult death rate may increase, which would allow space for more cubs. The rate of capture of wild-caught tigers may change either way, but may be likely to increase as the ability to "rescue" these animals improves and human-tiger conflicts continue. Space for more cubs in the PKBSI zoos can also be increased by removing surplus tigers from the program. Surplus tigers are those tigers which will not be bred due to factors such as age, unverified origin, or overrepresentation in the population. These tigers can be transferred to suitable non-PKBSI facilities in Indonesia or, if appropriate, exported to other Sumatran tiger regional programs in Australasia, Europe or North America. Exportation outside of Indonesia should only be done in cooperation with the CBSG Tiger Global Conservation Strategy.

Management Recommendations

Breeding Recommendations

Given the large number of wild-caught founders that have not yet reproduced, priority should be given to pairing tigers verified as wild-caught. The breeding of wild-caught tigers should take priority over breeding of captive-born animals to retain as much genetic diversity as possible. Captive-born tigers that derive from overrepresented genetic lines, primarily descendants of founders SB# 370 and 371, should not be bred, and in particular, they should not be bred to each other to avoid further inbreeding.

Breeding pairs formed using the mean kinship ranked list will follow a similar strategy. Pairs ideally should be formed from the top of the mean kinship list, working down the list as needed. Individuals near the top of the list should be paired with each other and should not be paired with tigers near the bottom. This would link rare genetic lines with common ones (e.g., the 908 line is currently linked with the 370/371 line). This makes it impossible in the future to increase the rare genes without also increasing the common ones, and prevent equal founder representation.

Once a potential pair has been selected, the GENES program can simulate a breeding between the selected tigers and display the resulting impact on the genetic measures of the population. The management committee can then easily evaluate whether such a breeding would be to the benefit or detriment of the program. Potential breeding pairs should also be checked for the inbreeding coefficient of the resulting offspring, and pairings resulting in $F > 0.10$ should be avoided.

Given all of the above considerations, the PKBSI Sumatran Tiger Management Committee made the following breeding recommendations at the masterplan meeting:

Table 3. Current breeding recommendations for PKBSI Sumatran tiger population.

Male				Female				Breeding Location	Inbreed. Coeff.
SB#/ Name	MK Rank	Origin	Current Location	SB#/ Name	MK Rank	Origin	Current Location		
872 Bukit	High	Wild	Taman Safari	869 Tera	High	Wild	Taman Safari	Taman Safari	0.0000
866 Hendra	High	Wild	Taman Safari	T9590 Cane	High	Wild	Taman Safari	Taman Safari	0.0000
870 Bagira	High	Wild	Taman Safari	882 Butet	Mod.	Capt. (none)	Taman Safari	Taman Safari	0.0000
935 Bagus	Mod.	Capt. (none)	Medan	T9629 Tele	High	Wild	Medan	Medan	0.0000
T9615 Ujang	High	Wild	Surabaya	908 Deli	Mod.	Wild	Surabaya	Surabaya	0.0000
881 Ucok	Mod.	Capt. (none)	Taman Safari	941 Arimbi	Mod.	Capt. (50%)	Yogyakarta	Yogya.	0.0000
885 Kulu	High	Wild	Ragunan	940 Srikandi	Mod.	Capt. (50%)	Yogyakarta	Ragunan	0.0000

– Number in () for captive-born tigers represents the amount of overrepresented 370/371 line in that individual.
 – The last two breeding recommendations (in italics) are pending the transfer of tigers between institutions.

The PKBSI Sumatran Tiger Management Committee will review the status of these breeding recommendations at its next meeting in November 1997.

Animal-by-Animal Recommendations

Specific recommendations were made for each animal in the PKBSI Sumatran tiger population and are included with the masterplan. This includes recommendations to verify the origin of questionable individuals, to exclude some individuals from the managed population (“surplus” these tigers), to breed or not breed particular tigers, and to consider certain individuals as candidates for possible future export to other regional Sumatran tiger programs.

Steps in the Forest: Efforts to Protect the Last Sumatran Tigers

Ronald Tilson, Philip Nyhus and Neil Franklin

Wading through flood waters up to our calves, our legs exhausted from the morning's march to check our infra-red triggered cameras, we reached the muddy path back to the river. The incessant rains had flooded almost all of the trails in the flat lowland rain forest habitat, and endless leaches stretched from forest undergrowth to catch a ride and have a meal. We approached the site where hours earlier we came across a fresh set of tiger prints.

A quiet crack — possibly a large animal moving away through the undergrowth — sounded to our right. We froze. Leaves falling? A pair of rocks? Or the back of a tiger's ears, bent forward in warning? All morning we had passed fresh tiger prints in the mud. Our cameras regularly capture large tigers along this trail. Then it was gone, melted away in the rain. The four of us, Dr. Ronald Tilson, Director of Conservation at the Minnesota Zoo, Philip Nyhus, a graduate student from the University of Wisconsin, Neil Franklin, a graduate student from the University of York in England, and Pak Darmi, a forest guard, headed toward the speed boat that would return us to base camp, nervous laughter shaking off our adrenaline.

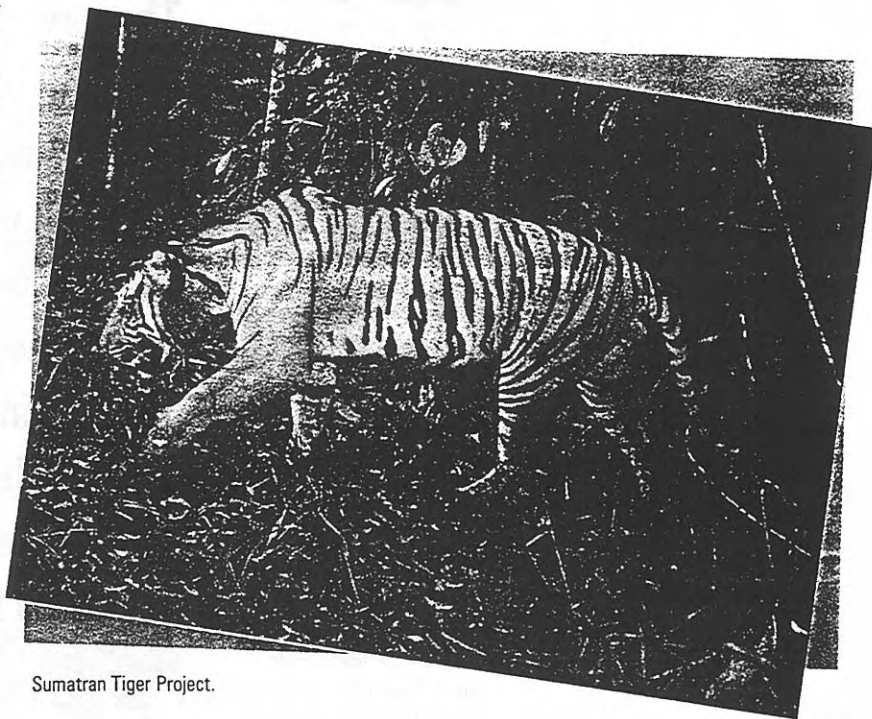
This was just one of many trips we have taken through the heart of Way Kambas National Park, one of the last lowland forests on the island of Sumatra, Indonesia. This 130,000 hectare reserve is home to one of the few remaining populations of the critically endangered Sumatran tiger, *Panthera tigris sumatrae*. This park is also home of the Sumatran Tiger Project, a collaboration among the Indonesian Ministry of Forestry's Department of Forest Protection and Nature Conservation (PHPA), Taman Safari Indonesia (TSI), the World Conservation Union's (IUCN) Conservation Breeding Specialist Group (CBSG) and the Minnesota Zoo. The Sumatran Tiger Project is a multi-year effort to study tiger ecology, threats to their habitat, and to develop long-term strategies to protect wild populations of tigers in Sumatra.

The Decline of the Tiger

A century ago, more than 100,000 tigers roamed from western Asia to the lush island of Bali in Indonesia. Today, only five of the original eight subspecies remain: the Siberian, South China, Indochinese, Bengal and the Sumatran. The Bengal tiger may have several thousand remaining individuals; the other four species combined may have as few as 1,000 individuals still in the wild, scattered across isolated patches of forests surrounded by a sea of humanity.

Nowhere has the decline of the tiger been as dramatic as in the Republic of Indonesia, the world's fourth most populous country, a vast archipelago of more than 17,000 islands that straddles the equator. Once home to three tiger subspecies, Indonesia now has only one. In 1937, the last Balinese tiger was killed, and in the early 1970's, the last verifiable signs of the Javan tiger were located in the rugged forest of east Java. Now all that remains is the myth. Today, decades of forest

clearing, rapid economic development, the creation of the large plantation estates, and large-scale migration of farmers from overcrowded Java to the once vast forests of Sumatra have all but decimated the last remaining tiger habitat. As habitat shrinks and is converted to farms and plantations, conflicts between tigers and people escalate. Tigers kill on average two people every year in Sumatra, and conflicts between humans and tigers are likely to get worse before they get better.



Sumatran Tiger Project.

Protecting the Tiger

In 1992, a meeting of leading tiger experts convened to assess the current status of the tiger in Sumatra. The sobering conclusion: from a population of thousands several years earlier, only 400 wild tiger were estimated to remain in protected areas spread across the island, with the possibility of another 100 or so in unprotected forests. Unless immediate steps were taken to reduce rapid forests destruction and conversion, curtail poaching, and monitor the viability of isolated populations, the survival of this majestic animal into the next century could not be assured.

In 1994, the Indonesian government, recognizing the immediacy of the problem, published the Indonesian

Sumatran Tigers continued on next page

Sumatran Tigers *continued from previous page*

Sumatran Tiger Conservation Strategy based on the action plan that evolved from the 1992 meeting. The main objective of the strategy is to develop and sustain a conservation program that will ensure the long-term viability of wild

Sumatran tigers. The Sumatran Tiger Project (STP) is providing research data so that management decisions for tiger conservation in Indonesia are based upon sound scientific evidence. The project was initiated in June 1995 by PHPA, TSI and Tilson, who is the project's director. As coordinator of the CBSG's Tiger Global Conservation Strategy, and a field biologist with years of experience in the forests of Southeast Asia, Tilson is considered one of the world's leading experts on captive and wild tigers. (Baston, a field technician with years of experience tracking the elusive Sumatran rhino, Sriyanto, a veterinarian from Java, and Sumianto, a social scientist who grew up next to the park, work with

Nyhus and Franklin to form the core of the project's team. PHPA forest guards and faculty and students from the university of Lampung provide valuable support and assistance in the field. The project was initially fund by Esso UK and now by Save The Tiger Fund, a joint project between the National Fish and Wildlife Foundation and the Exxon Corporation.)

In the project's first year, the team has set up more than 50 infra-red monitors and cameras to determine the number and distribution of tigers and their prey species within Way Kambas. We also worked in 20 villages surrounding the park to study local attitudes toward tigers, the extent of human-wildlife conflicts, and the level of poaching and illegal forest use. Sophisticated satellite global positioning systems and geographic informa-

tion system (GIS) maps help to integrate these large data sets. Combined with information from rapid assessment teams that will soon sweep across the island to document the presence of tiger and their threats,

these field data will provide the background necessary to develop needed community awareness and conservation programs, and contribute a solid scientific foundation for future tiger conservation planning decisions across Sumatra. A key component of tiger conservation efforts will include the wise management of captive tigers. Tilson and colleagues work closely with Taman Safari Indonesia and zoos across Java and Sumatra to coordinate management of these animals and link these institutions to field conservation efforts by developing methods to rescue "problem" tigers. These are tigers that have left the forest and crossed out of the park and are forced to kill domestic livestock to live. Rather than leav-

ing these tigers to be shot by local police, the rescue team is equipped to catch and transfer tigers to Taman Safari Indonesia.

Our activities at Way Kambas are just the first steps along a difficult and uncertain road for tiger conservation in Sumatra. Dramatic efforts continue in many tiger range countries as governments, organizations, and individuals face the challenge of reducing the damage caused by rampant poaching and habitat loss. The Indonesian government in particular has moved forward to meet these challenges through their bold initiatives. The paw prints in the mud and the adrenaline-inducing noises in the forest give us hope — but remind us of the difficult challenge the future still holds.

**The paw prints
in the mud and
the adrenaline-
inducing noises
in the forest
give us hope —
but remind us
of the difficult
challenge the
future still holds.**





Lembaga Ilmu Pengetahuan Indonesia
(The Indonesian Institute of Sciences)

PUSAT PENELITIAN DAN PENGEMBANGAN BIOLOGI

(RESEARCH AND DEVELOPMENT CENTRE FOR BIOLOGY)

Jl. Ir. H. Juanda 18, Bogor 16002, Indonesia P.O. Box 208 BOGOR

Telp. (0251) 321040 - 321041, Fax. 325854, Alamat kawat (cable address) "BIOL"

Bogor, 6 Juni 1997

Nomor : 2078/II - 1/RS/1997
Lampiran : 1 (satu) berkas.
Perihal : Permohonan ijin penelitian
a.n Mr. Ronald Tilson

Kepada Yth.
Bapak Sekditjen PHPA
Departemen Kehutanan
Gd. Manggala Wanabhakti
Jl. Gatot Subroto
Jakarta Selatan

Dengan hormat,

Bersama ini kami memberitahukan bahwa Mr. Ronald Tilson dari Amerika Serikat akan melakukan kegiatan penelitian yang berjudul "*Conservation Biology of Wild Sumatera Tiger in South Sumatera*" di T.N. Way Kambas, Sumatera Selatan selama 12 bulan mulai tanggal 9 Juni 1997. Puslitbang Biologi LIPI bertindak sebagai sponsor dalam penelitian ini. Sebagai bahan pertimbangan Bapak kami sertakan :

1. Surat Izin Penelitian LIPI
No. 2740/II/KS/1997, Tgl. 3 Juni 1997
2. Surat Keterangan Jalan POLRI
No. Pol. : SKJ/POA-5427/VI/1997/Dit IPP. Tgl. 4 Juni 1997
3. Surat Pemberitahuan Penelitian dari SOSPOL

Sehubungan dengan maksud tersebut di atas, kami mohon perkenan Bapak agar kepada Ybs. dapat diijinkan untuk memasuki kawasan tersebut dalam melakukan kegiatan penelitiannya. Besar harapan kami kiranya Bapak berkenan mengabulkan permohonan ini.

Atas perhatian dan kerjasama yang Bapak limpahkan, kami mengucapkan terima kasih.



Kepala Puslitbang Biologi-LIPI

Dr. Soetikno Wirjoatmodjo
NIP. 320001248

Tembusan kepada Yth.

1. Direktur BKPA, Ditjen PHPA, Dept. Kehutanan, Jakarta
2. Direktur BKSA Ditjen PHPA, Dept. Kehutanan, Jakarta
3. Kepala Kanwil Kehutanan, Lampung
4. Kepala Balitbang Zoologi-PPPB
5. Kepala Bidang Jasa & Informasi-PPPB
- ⑥ Peneliti Ybs.
7. Arsip .-



LEMBAGA ILMU PENGETAHUAN INDONESIA (Indonesian Institute of Sciences)

SASANA WIDYA SARWONO
Jl. Jendral Gatot Subroto No. 10, Jakarta 12710
Telp. : 5251542, 5225711

Tromol Pos : 1250/Jakarta 10012
4324/Jakarta 12190

Alamat Kawat : LIPI
Telex : 62554 IA
Fax. : 5207226

SURAT IZIN PENELITIAN

No. : ~~S.K./---~~ B-5/19

2740 /II/KS/1997

Lembaga Ilmu Pengetahuan Indonesia dengan ini menerangkan bahwa telah diberikan izin untuk mengadakan penelitian di Indonesia kepada peneliti berikut :

N a m a : Mr. Ronald Tilson
Tempat dan tanggal lahir : Montana, 12 Juli 1944
Warganegara : Amerika Serikat
J a b a t a n : Peneliti
A l a m a t : Minnesota Zoo, 13000 Zoo Blva Applevalley MN USA

Nomor paspor : 073167388
Tiba tanggal : 3 Juni 1997
Judul Penelitian : " Conservation Biology of Wild Sumatera Tiger in South Sumatera "
Tujuan Penelitian : Guna menambah pengetahuan
Bidang Penelitian : Biologi
Lamanya Penelitian : 12 bulan mulai Juni 1997
Daerah Penelitian : Sumatera Selatan (Way Kambas)
Sponsor Penelitian : Puslitbang Biologi - LIPI

dengan ketentuan sebagai berikut :

1. Melaporkan kedatangan dan maksud penelitiannya kepada instansi keamanan setempat dengan menunjukkan Surat Izin Penelitian ini, segera setelah ia tiba ditempat tujuannya, dan melaporkan diri sebelum meninggalkan daerah penelitiannya kepada Pemerintah Daerah, dan kepada Sponsornya di Indonesia.
2. Berbuat positif terhadap bangsa Indonesia, dan mentaati peraturan-peraturan hukum yang berlaku di Indonesia, khususnya yang berlaku di daerah penelitiannya.
3. Menjaga tata tertib, keamanan, kesopanan dan kesusilaan serta menghindari pernyataan-pernyataan baik dengan lisan maupun tulisan/lukisan yang dapat melukai/menyinggung perasaan, adat istiadat atau menghina agama, dari sesuatu golongan penduduk di Indonesia.
4. Memberikan laporan (yang diketik rangkap lima) kepada LIPI, setiap 3 (tiga) bulan sekali mengenai segala kegiatannya termasuk daftar kwesioner dan nama setiap orang yang telah di wawancara (kalau ada).
5. Sebelum meninggalkan Indonesia, menyerahkan laporan terakhir (yang diketik rangkap lima) dengan menyebutkan beberapa hasil sementara, serta kesan-kesan dari penelitiannya tersebut kepada LIPI, dan menyerahkan abstrak dari penelitian tersebut antara satu sampai dua halaman.



LEMBAGA ILMU PENGETAHUAN INDONESIA (Indonesian Institute of Sciences)

SASANA WIDYA SARWONO
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4324/Jakarta 12190

Alamat Kawat : LIPI
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Fax. : 5207226

- 2 -

6. Tidak dibenarkan membawa barang-barang/atau bahan-bahan yang menurut peraturan yang berlaku dilarang untuk dibawa ke luar negeri, kecuali dengan izin instansi yang berwenang, menurut peraturan yang berlaku.
7. Memberikan dalam rangkap tiga salinan dari tulisan-tulisannya (Thesis/Disertasi, paper, report atau publikasi lain) mengenai hasil penelitiannya tersebut kepada LIPI.
8. Semua tulisan tentang penelitian yang sedang dilakukan, apabila akan diterbitkan dalam di Indonesia harus terlebih dahulu mendapat persetujuan dari Lembaga Ilmu Pengetahuan Indonesia (LIPI).
9. Memberikan 1 (satu) copy foto-foto, slide/microfilm dan film/video cassette, cassette sebagai hasil penelitiannya kepada LIPI, kalau ada.
10. Surat Keterangan Izin Penelitian ini hanya berlaku selama visa dari Direktorat Jenderal Imigrasi R.I. dan Surat Keterangan Jalan dari Polisi masih berlaku.
11. Setiap usul perpanjangan dan atau perubahan daerah penelitian harus diajukan kepada LIPI selambat-lambatnya 3 (tiga) bulan sebelum surat Ijin Penelitian habis masa berlakunya dengan melampirkan surat rekomendasi dari sponsornya di Indonesia.
12. Setelah penelitian selesai diharap supaya Surat Izin Penelitian ini dikembalikan kepada Biro Kerjasama IPTEK - LIPI.
13. Permohonan untuk exit dan re-entry permit agar diajukan ke LIPI selambat-lambatnya satu bulan sebelum meninggalkan Indonesia disertai surat permohonan resmi dari yang bersangkutan dan surat rekomendasi dari sponsornya di Indonesia.

Demikian Surat Izin Penelitian No. 274/D/II/KS/1997 tanggal 3 Juni 1997 /
atas nama Mr. Ronald Tilson diberikan untuk dipergunakan seperlunya, dan
kami mohon dengan hormat, sudilah kiranya instansi-instansi Pemerintah/Swasta maupun perorangan yang dihubungi
untuk memberikan bantuannya kepada yang bersangkutan, sesuai dengan peraturan yang berlaku.

Jakarta 3 Juni 1997

LEMBAGA ILMU PENGETAHUAN INDONESIA



n. Deputi Bidang Ilmu Pengetahuan Alam
Kepala Biro Kerjasama Iptek

Soehardono Soedargo
Soehardono Soedargo.M.Soc.Sc
320000745



SURAT KETERANGAN JALAN
Traveling Permit

DIBERIKAN KEPADA / ISSUED TO

1. Nama / Name : RONALD LEWIS TILSON.
2. Tempat dan tgl. lahir / Place and date of birth : Montana, 12 Juli 1944.
3. Warganegara / Nationality : Amerika.
4. Pekerjaan / Occupation : Biology.
5. No. Paspor. tgl. dan berlaku s/d / Passport : 073167388 tgl. 14-12-1992.
No. Place and date of issued valid until : 13-12-2002.
6. Keterangan lain-lain / Others : VBS No.746/VBS/05/CKO/97 untuk 12 bulan.
Tiba tgl. 03-06-1997.

Atas perintah / persetujuan / Applied / aproved by

LEMBAGA ILMU PENGETAHUAN INDONESIA.

Tersebut dalam suratnya tanggal /
Re-letter of. date

03-06-1997 No. 2724/V3/KS/1996.

Maksud kunjungan / Purpose of visit
Ke / To

Riset dalam bidang Biologi.

Dalam rangka / In accordance with

Way Kambas-Sumsel.
Mengumpulkan data guna menambah pengetahuan
yang berjudul : "Conservation Biology /
04 Juni 1997 s/d/till 02 Juni 1998.

Mulai tanggal / From

PERHATIAN / ATTENTION

/ of Wild Sumatera Tiger
in South Sumatera".

- SC BAKIN No. :
R-985/VII/1996
tgl. 15-07-1996.
- After getting KITAS please
make SKLD (Police Registra-
tion Book) as soon as
possible.

- a. Penanggungjawab penginapan wajib menyampaikan daftar tamu OA kepada Kantor Kepolisian Negara RI setempat, selambat-lambatnya 24 (dua puluh empat) jam sejak tanggal kedatangan OA yang bersangkutan. (PP No. 31/1994 Pasal 9 ayat (2)).
- a. Managers of hotels, inns, boarding houses an the like are obligated to submit list of foreign visitors to the local office of the state Police not later than 24 hours since the arrival of the foreigners (PP No. 31/1994 Pasal 9 ayat (2)).
- b. Setiap orang yang memberikan kesempatan OA menginap ditempat kediamannya wajib melaporkan kepada Kantor Kepolisian RI atau pejabat Pemerintah Daerah setempat dalam jangka waktu 24 (dua puluh empat) jam sejak tanggal kedatangan OA tersebut, (PP No. 31/1994 Pasal 10).
- b. Anybody providing the opportunity to stay for foreigners is obligated to report to the office of the state Police or the local Regional administration within 24 hours since the arrival of the foreigners (PP No. 31/1994 Pasal 10).

Dikeluarkan / Issued : Jakarta
Pada tanggal / date : 04 Juni 1997.



An DIREKTUR INTELIJEN DAN PENGAMANAN POLRI
SUB DIREKTORAT POA
Drs. PURWONO SIGIT

DEPARTEMEN DALAM NEGERI REPUBLIK INDONESIA
DIREKTORAT JENDERAL SOSIAL POLITIK

JALAN MEDAN MERDEKA UTARA NOMOR 7 TELEPON 373908 JAKARTA PUSAT

SURAT PEMBERITAHUAN PENELITIAN

(S P P)

NOMOR : 070/659

MEMBACA : Surat KARO KERJASAMA IPTEK LIPI
: No. 2741/V3/KS/97 tgl. 4 Juni 1997

MENINGAT : 1. Keputusan Presiden Republik Indonesia Nomor 100 Tahun 1993
tentang Izin Penelitian Bagi Orang Asing..
2. Keputusan Menteri Dalam Negeri Nomor 92 Tahun 1992 tentang
Organisasi dan Tata Kerja Departemen Dalam Negeri.
3. Surat Mendagri Nomor : 1270/SOSPOL/DV/X/1980 tanggal 21
Oktober 1980 tentang Pengawasan Terhadap Kegiatan orang
Asing.

MEMPERHATIKAN : 1. SIP LIPI NO. 2740/II/KS/1997 tgl. 3 Juni 1997
2. SKJ POLRI NO. 5427/VI/1997/DIT IPP tgl. 4 Juni
1997 Berlaku s.d 2 Juni 1998.

Memberitahukan bahwa telah diberikan Izin Penelitian oleh :
LIPI

Untuk melakukan Penelitian kepada :

NAMA : RONALD LEWIS TILSON.

ALAMAT : Minnesota Zoo, 13000 Zoo Blva Applevally MN USA.

PEKERJAAN : Peneliti.

KEBANGSAAN : Amerika Serikat

JUDUL : CONSERVATION BIOLOGY OF WILD SUMATERA TIGER IN
SOUTH SUMATERA.

BI D A N G : Biologi.

DAERAH PENELITIAN : Way Kambas, Prop Lampung.

LAMA PENELITIAN/
KEGIATAN : 12 bulan s.d 2 Juni 1998.

PENGIKUT/ PESERTA : -

PENANGGUNG JAWAB : LIPI

S P O N S O R : Puslitbang Biologi LIPI.

BIAYA DARI : -

Akan melakukan kegiatan penelitian/kunjungan, dengan

1. Sebelum melakukan kegiatan penelitian harus melaporkan kedatangannya kepada Gubernur Kepala Daerah Tingkat I Cq. Kepala Direktorat Sosial Politik setempat dengan menunjukkan Surat Pemberitahuan ini.
2. Tidak dibenarkan melakukan penelitian yang tidak sesuai/tidak ada kaitannya dengan judul penelitian dimaksud.
3. Harus mentaati sesuai ketentuan perundang - undangan yang berlaku serta mengindahkan adat - istiadat setempat.
4. Apabila masa berlaku Surat Pemberitahuan ini sudah berakhir, sedangkan pelaksanaan penelitian belum selesai perpanjangan penelitian harus diajukan kepada instansi pemohon
5. Surat Pemberitahuan ini akan dicabut kembali dan dinyatakan tidak berlaku, apabila ternyata pemegang Surat Pemberitahuan tidak mentaati/mengindahkan ketentuan - ketentuan seperti tersebut diatas.

Dikeluarkan di : J a k a r t a ,

Pada tanggal : 4 Juni 1997.

An. MENTERI DALAM NEGERI
DIREKTUR JENDERAL SOSIAL POLITIK

u.b

DIREKTUR PEMBINAAN POLITIK



SUKO MARTONO

Tembusan :

1. Yth. GUB KDH TK I LAMPUNG
Up. KADIT SOSPOL PROP
2. Yth. KARO KERJASAMA IPTEK LIPI
3. Yth. DIR IPP MABES POLRI
4. A r s i p .-



PEMERINTAH KABUPATEN DAERAH TINGKAT II LAMPUNG TENGAH

KANTOR SOSIAL POLITIK

Jln. Jend. Sudirman No. 8 Telp. (0725) 41128

METRO

SURAT IZIN RESEARCH SURVEY/ PENELITIAN/PENGABDIAN / KKN/ KKL

Nomor : 070 / 168 / SOSPOL LT/ 19...97.

- MEMBACA** : Surat dari Kadit Sospol Tk. I Lpg No. 070/1540/G. Sospol/1997 tgl, 12 Juni 1997 perihal Izin kunjungan peneliti an An. Mr RONALD LEWIS TILSON.
- MENGINGAT** : 1. Keputusan Menteri Dalam Negeri Nomor : 134 Tahun 1978 Tanggal 11 Agustus 1978, Jo. Gubernur KDH. Tk. I Lampung Nomor : G / 202 / DSP / HK / 1978 Tanggal 20 Desember 1978, tentang Struktur Organisasi dan Tata Kerja Direktorat Sosial Politik Propinsi Lampung.
2. Keputusan Direktur Jenderal Sosial Politik Departemen Dalam Negeri No. 14 Tahun 1981 tanggal 13 Juni 1981, tentang Surat Pemberitahuan Penelitian.
3. Surat Gubernur KDH. Tk. I Lampung No. OP. 030/461 / G / SOSPOL 1985 tanggal 5 Pebruari 1985, tentang Permohonan Izin Penelitian/ Survey Bagi Dinas/ Instansi dan Mahasiswa.
- MEMPERHATIKAN** : Surat surat izin yang bersangkutan.
- DENGAN INI DIBERIKAN IZIN KEPADA :**
- N a m a** : Mr. RONALD LEWIS TILSON (Kebangsaan Amerika Serikat)
- Jabatan** : Peneliti Bidang Biologi
- Alamat** : Minesota Zoo. 13000 Zoo Biva Applevally MN USA.
- Daerah / Lokasi** : Taman Nasional Way Kambas Kab. Lampung Tengah.
- Lamanya** : 12 bulan, s/d 2 Juni 1998.
- Pengikut / Anggota** : -
- Penanggung Jawab** : LIPI Jakarta.
- Tujuan** : Melakukan penelitian dengan judul "CONSERVATION BIOLOGY OF WILD SUMATERA TIGER IN SOUTH SUMATERA".

Catatan :

Setelah selesai mengadakan Research / Survey / Penelitian agar melaporkan hasilnya kepada Bupati Kepala Daerah Tingkat II Lampung Tengah Cq. Kepala Kantor Sosial Politik secara tertulis.

DIKELUARKAN DI : M E T R O.

PADA TANGGAL : 23 Juni 1997.

TEMBUSAN :

1. Bp. Gubernur Kdh. Tk. I Lampung Cq. Kadit Sospol.
2. Sdr. Dan Dim 0411 Lampung Tengah.
3. Sdr. Kapolres Lampung Tengah.
4. Sdr. Ka. Kejari Lampung Tengah.
5. Sdr. Ketua Bappeda Lampung Tengah.
6. Sdr. Camat Way Jepara LT.
7. Sdr. Kepala SBKSDA Way Jepara.
8. Sdr.

An. KEPALA KANTOR SOSIAL POLITIK,
KASI KETERTIBAN,



ROBINSON, SH.

NIP. 010222673.-



DEPARTEMEN PENDIDIKAN DAN KEBUDAYAAN REPUBLIK INDONESIA
UNIVERSITAS LAMPUNG
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM

Jalan Prof. Dr. Sumantri Brojonegoro 1, Bandar Lampung 35145
Telepon. (0721) 704625 Fax. (0721) 702767

Dalam menjawab surat ini sebutlah tanggal dan nomor

Nomor : 67 /J26/7.2/KM/1997 29 April 1997
Lampiran : -
Perihal : Counterpart Sumatran Tiger Project.

Kepada Yth.,
Kepala Lembaga Penelitian Unila
Jl. Prof. Dr. Soemantri Brojonegoro No. 1
di
Bandar Lampung 35145

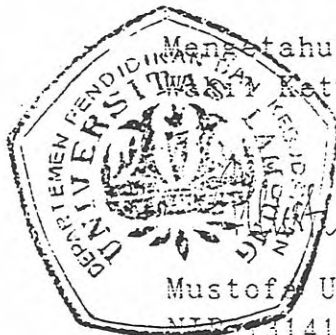
Dengan hormat,

Sehubungan dengan adanya minat mahasiswa kami :

Nama : Ma'turidi
NPM : 92171216
Jurusan : Biologi FMIPA Unila

untuk menjadi "Counterpart" di "Sumatran Tiger Project" Way Kambas dalam rangka untuk menyelesaikan tugas akhir (skripsi), maka kami mohon agar mahasiswa tersebut dapat dibantu.

Demikian atas perhatian yang diberikan diucapkan terima kasih.



Mengetahui :
Ketua FMIPA Unila,

Mustofa Usman, Ph.D.
NIP. 31414096

Hormat kami
Ketua Jurusan Biologi,

Drs. M. Kanedi, M.S.
NIP. 131964588

Tembusan :
1. Ketua FMIPA Unila
2. Arsip



DEPARTEMEN PENDIDIKAN DAN KEBUDAYAAN
UNIVERSITAS LAMPUNG
LEMBAGA PENELITIAN

Gedung Rektorat Lantai 5
Jl. Prof. Dr. Sumantri Brojonegoro No. 1, Bandar Lampung, 35145
Telp. (0721) 705173, Fax. 705173, 702767

Dalam menjawab surat ini sebutkan tanggal dan nomor.

Nomor : /35/J26/8/PL/1997
Lampiran :
Perihal : Pengirim mahasiswa

1 Mei 1997

Yth. Saudara Ir. Suherti
Kepala Taman Nasional Way Kambas
di
Rajabasa Lama - Lampung Tengah

Menindaklanjuti pengiriman mahasiswa untuk turut serta
sebagai Counterpart dalam proyek Penyelamatan Harimau Suma-
tera (Sumatran Tiger project) di Taman Nasional Way Kambas,
bersama ini kami mengirimkan mahasiswa:

N a m a : Ma'turidi
N P M : 92171216
Jurusan : Biologi
Fakultas : MIPA Unila

Atas perhatian dan bantuan Saudara, kami ucapkan terima
kasih.



Muhajir Utomo, M.Sc.

130541496

Tembusan:
1. Rektor Unila
2. Ketua FMIPA Unila



DEPARTEMEN KEHUTANAN
KANTOR WILAYAH PROPINSI LAMPUNG
BALAI KONSERVASI SUMBER DAYA ALAM II TANJUNG KARANG
SUB BALAI KONSERVASI SUMBER DAYA ALAM
WAY KAMBAS

Jalan Raya Labuhan Ratu Lama, Way Jepara - Lampung Tengah (Lampung) Telp. :

Labuhan Ratu Lama, 12 Mei 1997.

Nomor : 502/Kwl.Sbksda-wk/1997.
Lampiran : -
Perihal : Pengiriman Mahasiswa.

Kepada Yth,
Direktur Sumatran Tiger
di -
Way Kanan.

Sehubungan dengan surat dari Universitas Lampung Nomor : 135/J26/8/PL/97 tanggal 1 Mei 1997. Seperti pada pokok surat di atas, maka dengan ini kami kirimkan mahasiswa dari Universitas Lampung untuk turut serta se - laku Counterpart di Proyek yang saudara pimpin :

Nama : Ma'turidi
N P M : 92171216
Jurusan : Biologi
Fakultas : MIPA Unila

Atas perhatian dan bantuannya kami ucapkan terimakasih.-

An. Kepala Sub Balai
Konservasi Sumber Daya Alam II
Sis Pemanfaatan



Jakarta Post, 26 June 1997

Tigers habitat is dwindling

JAKARTA: A Sumatran tiger ate three people in West Lampung in recent weeks because the tigers' habitat is shrinking, a World Wide Fund for Nature (WWF) expert has said.

"The dwindling size of their natural habitat has caused the Sumatran tigers to go on a rampage," WWF tiger expert Ron Lilley told *Antara* here Tuesday.

The Lampung natural resources conservation center said Monday that it was trying to catch the Sumatran tiger that had killed three people and injured three others in Sumberjaya subdistrict between June 7 and 20.

Lilley said the tiger's habitat had been converted into plantations or human settlements which had prompted the animal to retaliate by attacking people.

He said a similar thing had happened in recent years in Bengkulu province, where Sumatran elephants had trampled on villages and plantations.

Lilley said the WWF was cooperating with the Directorate General for Forest Protection and Nature Conservation (PHPA) to stop smuggling of tiger bones out of Indonesia.

"The WWF and the PHPA are determined to combat the trade of tiger bones," he said.

Indonesian tigers' bones are sold in black markets in China, South Korea and the United States to make traditional medicine for diseases.

Lilley said the international trade of tiger bones was threatening the survival of Indonesian tigers, which have been declared an endangered species.

There are only an estimated 500 Sumatran tigers left, 100 of these live outside conservation areas. Javanese and Balinese tigers have been extinct for decades. (swe)