

# Tapir Conservation

The Newsletter of the IUCN/SSC Tapir Specialist Group

*Edited by Siân S. Waters and Stefan Seitz*

(c) Kevin Burkhill



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The Baird's Tapir Project in Corcovado National Park, Costa Rica, represents the first long-term project to gather detailed, reliable information on the ecology of free-ranging tapirs. Initiated by Charles Foerster eight years ago, the study is using radio telemetry and direct observation to document home range size, activity patterns, habitat use, reproductive rate, offspring and adult sex ratios, offspring survival, juvenile dispersal, spatial distribution, population density and mortality rates of an intact tapir population. Up to now 27 different tapirs have been radio-collared and monitored. "Prima" in the photo is one of 13 offspring born during the study. She has now grown enough to be collared and is providing the study with valuable data. Photo by Charles Foerster

Printing and distribution of the Tapir Conservation Newsletter is supported by the Houston Zoo, 1513 N. MacGregor, Houston, Texas 77030, United States <http://www.houstonzoo.org>



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Abbreviation: *Tapir Cons.*

Volume 11, Number 2, December 2002

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- Production & Distribution** This issue is kindly sponsored by Houston Zoological Gardens, General Manager, Rick Barongi, 1513 North Macgregor, Houston, Texas 77030 USA.
- Subscriptions** Members of the Tapir Specialist Group receive the newsletter free of charge. Subscriptions for non-members are \$10.00 per year and can be obtained from Sheryl Todd, Tapir Preservation Fund, [tapir@tapirback.com](mailto:tapir@tapirback.com).
- Website** [www.tapirback.com/tapirgall/iucn-ssc/tsg/](http://www.tapirback.com/tapirgall/iucn-ssc/tsg/)
- Scope** – This newsletter aims to provide information regarding all aspects of tapir natural history. Items of news, recent events, recent publications, thesis abstracts, workshop proceedings etc concerning tapirs are welcome.
- Please include the full name and address of the authors underneath the title of the article.
- Full-length articles** on any aspect of tapir natural history should not be more than 15 pages in length (including references). An abstract is required and British English spelling is requested.
- Figures and Maps.** Articles etc can include black and white photographs, high quality figures and high quality maps and tables.
- References.** Please refer to these examples when listing references:
- Journal Article**  
Herrera, J.C., Taber, A., Wallace, R.B. & Painter, L. 1999. Lowland tapir (*Tapirus terrestris*) behavioural ecology in a southern Amazonian tropical forest. *Vida Silv. Tropical* 8:31-37.
- Chapter in Book**  
Janssen, D.L., Rideout, B.A. & Edwards, M.S. 1999. Tapir Medicine. In: M.E. Fowler & R. E. Miller (eds.) *Zoo and Wild Animal Medicine*, pp. 562-568. W.B. Saunders Co., Philadelphia, USA.
- Book**  
Brooks, D.M., Bodmer, R.E. & Matola, S. 1997. *Tapirs: Status, Survey and Conservation Action Plan*. IUCN, Gland, Switzerland.
- Thesis/Dissertation**  
Foerster, C.R. 1998. *Ambito de Hogar, Patron de Movimiento y Dieta de la Danta Centroamericana (Tapirus bairdii) en el Parque Nacional Corcovado, Costa Rica*. M.S. thesis. Universidad Nacional, Heredia, Costa Rica.
- Report**  
Santiapilli, C. & Ramono, W.S. 1989. *The Status and Conservation of the Malayan tapir (Tapirus indicus) in Sumatra, Indonesia*. Unpublished Report, Worldwide Fund for Nature, Bogor, Indonesia.

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## Letter From the Chair

As reported in the last issue of this newsletter, several committees were created during the First International Tapir Symposium and I am sure you are all curious to hear about their progress. These committees have been working on specific tasks related to the structure of the TSG, internal and external communication and fundraising. Preliminary results include the creation of guidelines for TSG membership and proposals seeking TSG endorsement/support and the development of a list of responsibilities for each one of the TSG officers. As you have all probably noticed, our *Tapir Conservation* Newsletter editorial team – Siân Waters, Stefan Seitz and Kelly Russo – restructured the publication, increasing the number and quality of articles and improving the country and species representation. Financial support from the Houston Zoological Gardens will enable us to publish two issues per year. The Houston Zoo graphic department is also helping us to develop educational and organisational brochures about tapirs and the TSG.

Our veterinary committee, coordinated by Dr. Sonia Hernandez-Divers, is working on protocols for tapir immobilization, manipulation and collection of biological samples. They are also working to improve communication between field researchers and veterinarians, identifying the needs of field biologists in terms of veterinary support. All this information will be made available on-line soon. Another committee, led by Siân Waters, is working to improve the communication between field researchers and zoos. As part of this work, tapir researchers have been visiting zoos and making presentations about their work in the field and about the TSG.

Our Fundraising Committee is working on the development of strategies to raise funds for the group itself and those tapir researchers and educators working in the field and captivity. We are still working on the ideas generated during the symposium but, as reported before, the main concept is to create a TSG Conservation Fund functioning as an additional funding source for tapir projects. We believe that a major advantage of this strategy is that we will be raising funds for tapir conservation in general and not for specific projects. Since Specialist Groups are not legal entities in themselves, we will rely on the Tapir Preservation Fund (TPF) to collect, manage and distribute the grants to researchers through a selection process. The committee is currently putting together a proposal for the TSG as a whole. Once we have this proposal, we will iden-

tify and contact potential donors such as the large conservation NGOs, trusts and foundations, zoos, industries, private donors, etc. In addition to a standard written proposal we will prepare a multimedia presentation that can be presented in person by TSG representatives.

We are also planning a major zoo campaign directed at tapir holders worldwide, but particularly in the United States and Europe, to seek contributions, as has been done for other taxonomic groups in the past. Ideally we would have the support of the AZA and EAZA Tapir TAGs for organizing and conducting this campaign. Another strategy we will use to raise funds will be the development of the “Friends of TSG” program. The idea is to create a list of and contact potential private donors that could make annual contributions to the TSG Conservation Fund. We will have several different ranges of contribution and each person will be able to choose how much she/he would like to donate.

During the past few weeks, we had to make a few changes in the structure of the TSG group. Our membership list was reviewed and updated and six members were removed from the group. Some of them requested their withdrawal due to personal and/or professional reasons and some were removed due to their complete lack of communication with the group. Now, more than ever in the history of the Tapir Specialist Group, we need the support of the membership to reach all the objectives and goals we have set. We need active and communicative members working with us. We keep saying that the communication between TSG members and tapir people in general has increased significantly over the past few years, but we still have a long way to go in terms of establishing really effective and productive communication between us. We have a lot of work to do and we need the membership to be active and working as a group.

Fifteen field projects are currently being conducted by TSG members, 5 on lowland tapirs, 4 on Baird’s tapirs, 4 on mountain tapirs and 2 on Asian tapirs. I am especially glad to communicate that a Malay Tapir Research Project has



just been established at Krau Wildlife Reserve in Malaysia. The research is being carried out under the coordination of our TSG member Bengt Holst from the Copenhagen Zoo in close cooperation with the University of Copenhagen and the Department of Wildlife and National Parks of Malaysia. Bengt has planned to conduct a series of research projects in Peninsular Malaysia with the purpose of studying tapir behaviour and ecology and the first phase of this project involves a pilot radio telemetry study in Krau Reserve (see a brief report on this study in the news section).

I am also especially happy to communicate that we have been receiving a significant number of e-mail messages from researchers in Brazil, Peru, Guatemala, French Guyana, Nicaragua, Costa Rica and Ecuador, countries where we haven't had many contacts in the past. Two researchers in Peru, one in Brazil, one in French Guiana and one in Costa Rica are establishing tapir research projects in several different forest habitats in their countries. It is really amazing how much the number of tapir projects has increased over the past five or six years and it is our job to give these professionals as much support as they need to establish their projects.

In October 2002, the Ministry of the Environment and the National University of Colombia hosted a workshop to discuss the current status and conservation priorities for the three tapir species inhabiting Colombia. Our TSG member, Olga Montenegro, was the main organiser of the workshop. Participants included representatives from universities, zoos, NGOs, governmental agencies, parks, etc. Our TSG members Emilio Constantino (Species Coordinator for mountain tapirs), Olga Montenegro, Diego Lizcano, Franz Kastón Flores, Jaime Suárez and Sérgio Sandoval Arenas were active participants of the workshop and shared their knowledge regarding the conservation status of tapirs in Colombia. Our Deputy-Chair, Charles Foerster, and myself were invited to participate in the event and contribute to the development of a tapir action plan for that country. I strongly believe that the action plan produced during this workshop is a very high quality document and will be an extremely useful tool for the conservation of tapirs in Colombia and in other countries of Latin America. The results from this workshop can be found in A Short Report from a Workshop on Tapir Conservation in Colombia in this issue.

The TSG, the Department of Wildlife and National Parks of Malaysia, the EAZA Tapir and Hippo TAG, and the IUCN/SSC Conservation Breeding Specialist Group are

working on the organisation of a Malay Tapir Conservation Workshop. During the First International Tapir Symposium it became clear that one of the biggest concerns among tapir experts today is Malay tapir conservation. Based on this, the TSG decided to organise and hold a workshop in Asia, and the selected venue was Malaysia. The main goal of the workshop is to gather, evaluate and discuss all available data and information on Malay tapirs and to use this information for the revision of the Malay tapir chapter of the 1997 Tapir Action Plan. This will then generate research and establish management options and conservation priorities for the species. The workshop will be held in Krau Wildlife Reserve in April 2003 and will have 60 invited participants representing all the tapir range countries in Asia. For more details about this event, please see the "Malay Tapir Conservation Workshop" article in this issue.

I also would like to mention that the TSG is already taking the first steps on the organisation of the II International Tapir Symposium, which will be held in Panama City, Panama, in November or December of 2003. In January 2003, members of the TSG will meet in Houston, in the United States, to form the organising committee and start working on the final planning. As always, we will keep you updated on this and we hope you will be able to be with us in Panama.

Finally, I would like to thank all of you who submitted contributions for this issue. We hope to be able to continue improving our *Tapir Conservation* Newsletter and your contributions are fundamental for this process.

Thank you very much!

My very best wishes from Brazil,

**Patrícia Medici**

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## IUCN/SSC Tapir Specialist Group History

During the past few months, several Tapir Specialist Group (TSG) members have sent me e-mail messages asking for information about the history of the TSG. As a result, I decided to get in touch with the previous TSG chairs and the President of the Tapir Preservation Fund, Sheryl Todd, and they helped me to put together this article. So... here is the history...

Keith Williams was appointed the founding chairperson of the Tapir Specialist Group in 1980 following his work with Malay tapir (*Tapirus indicus*) in Malaysia in 1975-1976 and continued to input information to the Red Data Book over subsequent years. The group commenced work with five members from Australia, Indonesia, Costa Rica and the USA (2). Nobody was doing field research at that time and Williams' work was the first intensive tapir field study. He was the first researcher to immobilize, radio-collar and track tapirs in the wild. A draft Action Plan for all the tapir species was developed in 1980-1981 and submitted to the IUCN/SSC. However, it was never developed further as there was little response from the SSC secretariat. Williams began his fieldwork on Baird's tapir (*Tapirus bairdii*) in Costa Rica in January 1981 and finished in February 1983. By that time the TSG had eight members. Prior to that, Daniel Janzen had done some feeding preference work with a captive tapir in Costa Rica. All other work reported on tapirs was from incidental observations.

Williams's research work in Costa Rica, funded by the Wildlife Conservation Society (then Wildlife Conservation, NYZS), was the first extensive study of any tapir species. While he was in Costa Rica, José Fragoso began work on *Tapirus bairdii* in Belize, and Craig Downer was developing a proposal for studying mountain tapir (*Tapirus pinchaque*) in Colombia. Downer undertook at least one initial field survey near Cali, Colombia. A review of the status of tapirs in Indonesia (Sumatra) appeared in *Tigerpaper* in about 1985-1986 written by a team of Indonesians. Other than that some genetic work was being done about 1982 at the San Diego Zoo. Alan Rabinowitz made observations of tapirs along with his work on jaguars in Central America (Belize) in the 1980s.

In September 1990, Sharon Matola took over the Chair from Keith Williams. With funding support from Wildlife Preservation Trust International, now Wildlife Trust, she created the *Tapir Conservation* newsletter which was ano-

ther step toward professional status for the group. The first six issues of the newsletter were published working from a manual typewriter in Sharon's office at the Belize Zoo. She tried to garner a network of communications, this was slow going, but did grow steadily. In 1991, Sharon began submitting regular contributions to *Species*, the official magazine of the IUCN/SSC. The magazine is a valuable forum for making SSC groups known to other members, and Sharon made sure the tapir group was represented regularly. Under her direction, the Tapir Action Plan was written, and published in 1997. In 1997, a new officer was added when Sharon appointed Sheryl Todd as Deputy Chair and co-editor of the newsletter. Sheryl's experience with the Internet helped generate a new level of communication, and in 1998, the Tapir Specialist Group grew in size, with members in almost every tapir range country. Communication expanded among tapir researchers, students and conservationists, and a web site for the group was developed.

By the end of 1999, the conservation struggle in Belize had escalated, claiming most of Sharon Matola's time. In February 2000, Sharon stepped down from the position and I agreed to take over as chair.

I hope this satisfies your curiosity!

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## Tapir Conservation Workshops

### Malay Tapir Conservation Workshop Krau Wildlife Reserve, Malaysia 12-16 April 2003

The IUCN/SSC Tapir Specialist Group (TSG), the Department of Wildlife and National Parks (DWNP) of Malaysia, the European Association of Zoos and Aquariums (EAZA) Tapir and Hippo Taxon Advisory Group (TAG) and the IUCN/SSC Conservation Breeding Specialist Group (CBSG) are working on the organisation of the Malay Tapir Conservation Workshop. The workshop will be held at Krau Wildlife Reserve, Malaysia, from 12 to 16 April 2003. We will have 60 pre-selected and invited participants representing all the Malay tapir range countries. The TSG membership and local supporters in Asia will identify the potential participants and stakeholders.

#### Background

During the *First International Tapir Symposium* held in Costa Rica in November 2001 it became clear that one of the biggest concerns among tapir experts today is the conservation of the Malay tapir. The Malay tapir is presently listed as Vulnerable on the IUCN Red List of Threatened Species (2002 Assessment), meaning that this species is facing a high risk of extinction in the wild in the medium-term future. Furthermore, the species is listed on CITES Appendix 1, which largely bans their international trade. According to Meijard & van Strien (in press), habitat destruction and human disturbance have had major impacts on the survival of the species. So far the legal protection of tapirs seems to have been unable to slow down their decline. The slow reproduction rate of tapirs may make it difficult for it to recover from low population numbers, especially now that their range is completely fragmented, leaving small remnant populations isolated from each other. Another serious factor is that in many parts of its range the Malay tapir occurs outside protected areas.

Additionally, the data and information currently available on Malay tapirs is not enough to provide a clear view about the conservation status of the species. Malay tapir distribution, for example, has never been studied in depth. More than 180 years after scientists first described the species we are still largely at a loss about basic facts such as the estimated total number of Malay tapir or the exact distribution

range of the species. As stated by the IUCN/SSC Tapir Specialist Group *Tapirs: Status Survey and Conservation Action Plan* (Brooks, Bodmer & Matola 1997), the Malay tapir is a very important flagship species and many sympatric species could be placed under an umbrella of protection. The problems facing Malay tapir in every country of occurrence have to be evaluated, with appropriate required actions recommended for implementation.

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

#### Objectives and Goals

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

#### Expected Outcome

The main outcome of the workshop should be an update and refinement of the Malay Tapir section of the 1997 Tapir

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

### Workshop Format

The workshop will be guided by the IUCN/SSC Tapir Specialist Group (TSG) in the framework of updating and development of the IUCN/SSC Status Surveys and Conservation Action Plan for the Malay Tapir. The workshop will include a PHVA guided by the IUCN/SSC Conservation Breeding Specialist Group (CBSG). Our ability to develop the Action Plan and the PHVA will be greatly improved by an intensive population and habitat data assembly and analysis in advance of the workshop. Therefore, the workshop will be conducted through the following steps:

#### ***Step 1 – Data gathering and creation of the Malay tapir central database:***

this will be conducted prior to the workshop. The idea is to define the current range limits of Malay tapirs using maps generated from a GIS. We already have data about the general distribution of Malay tapir throughout the range, records for a number of locations, and base maps for a GIS system. Additionally, TSG members in Asia and other professionals and institutions will be asked to contribute recent information from field surveys, interviews, and professional estimates of tapir distributions. Sources of data will be publications (*e.g.* journals, books, newspapers), reports (*e.g.* management plans, EIA's, survey reports), photo trap data, personal observations, zoo inventories, museum collections, hunting records, etc. All records will be tagged with the original source and with the person supplying the information to the database. For the

purpose of the workshop, all data will be transferred to a central database incorporating the specifics provided by all the sources. This database will ultimately be made available to everyone that has contributed and will be used to make detailed distribution maps for all the areas where tapir occurs ahead of the workshop as a basis for designing the updated action plan. One of the immediate results of the database and the GIS should be the definition of Tapir Conservation Units (TACU's), geographic areas that provide varying levels of potential for long-term survival of the species. Using the TACU's we will look more closely at what is needed to save the tapir in different parts of its range. The analysis would serve to define the priority areas for the conservation of Malay tapirs, and the priorities for funding tapir research and conservation in the future.

#### ***Step 2 – Database presentation and discussion:***

first session of the workshop. The results of the database and GIS maps will be presented to the workshop participants.

#### ***Step 3 – Population and Habitat Viability Analysis (PHVA):***

all data and information previously gathered will be used to facilitate the PHVA. The PHVA is a very efficient and systematic working process with the goal of getting all relevant stakeholders together, identifying status and problems, and based on that, generating research and establishing conservation priorities for specific species. It combines a quantitative risk assessment tool with intensive discussions and deliberations on the biological and social issues relevant to the species conservation across its range. The PHVA will develop a large set of alternative models that represent different hypotheses of tapir biology/ecology and then, through comparison of model behaviours, identify those biological factors that most acutely influence tapir population growth. With this knowledge, and with data on the specific threats that are known to impact tapir populations now or in the future, we will design and test management strategies that minimize those specific threats which act on the most influential biological factors. With this comparative approach, significant insight can be gained with surprisingly little detailed biological data.

#### ***Step 4 – Recommendations and Action Planning:***

Nico van Strien (International Rhino Foundation and TSG Malay Tapir Coordinator) and Erik Meijaard (Australian National University and TSG member), with the support of Antony Lynam (Wildlife Conservation Society and TSG member), will be in charge of gathering the data and creating the central database and the GIS. The IUCN/SSC



Conservation Breeding Specialist Group (CBSG), in the person of the Programme Officer, Dr. Philip Miller, will be in charge of designing the format of the PHVA and producing the necessary support materials and final documents.

We will keep you posted about the results of the workshop and future actions in terms of Malay tapir conservation.

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## **A Short Report from a Workshop on Tapir Conservation in Colombia**

By Olga L. Montenegro

A national programme for tapir conservation has been developed under an inter-institutional agreement between the Colombian Ministry of the Environment and the Natural Science Institute of the National University of Colombia. This framework of the programme is within the Implementation of a National Strategic Plan for Endangered Species Conservation Project by the Ministry of the Environment. The preliminary version of the document, the National Programme for Tapir Conservation and Recovery in Colombia, comprises general information on tapirs, a summary of the current conservation status of the three tapir species found in Colombia – Baird's tapir, (*Tapirus bairdii*), mountain tapir (*Tapirus pinchaque*) and lowland tapir (*Tapirus terrestris*), and a proposed conservation programme. The summary includes information gathered from many sources - a national survey of regional environmental agencies, national parks, zoos, research institutions, several NGO's and individual researchers was an important source of up to date information. The proposed conservation and recovery programme includes short, medium and long-term goals and strategies. The preliminary version of this document was recently discussed during a national workshop held at the Flora and Fauna

Sanctuary Otún-Quimbaya in the central Colombian Andes on October 29<sup>th</sup> to 31<sup>st</sup>, 2002.



Fifty people attended the workshop and their main tasks were to discuss and compile a national programme with the national environmental system institutions and researchers. Participants included representatives of the Ministry of the Environment, regional autonomous environmental agencies, national parks, zoos, research institutions and universities. Tapir Specialist Group Chair, Patrícia Medici, and Deputy Chair, Charles Foerster, as well as most of the TSG Colombian members and other researchers attended the workshop. The first day consisted of invited presentations, which were as follows:

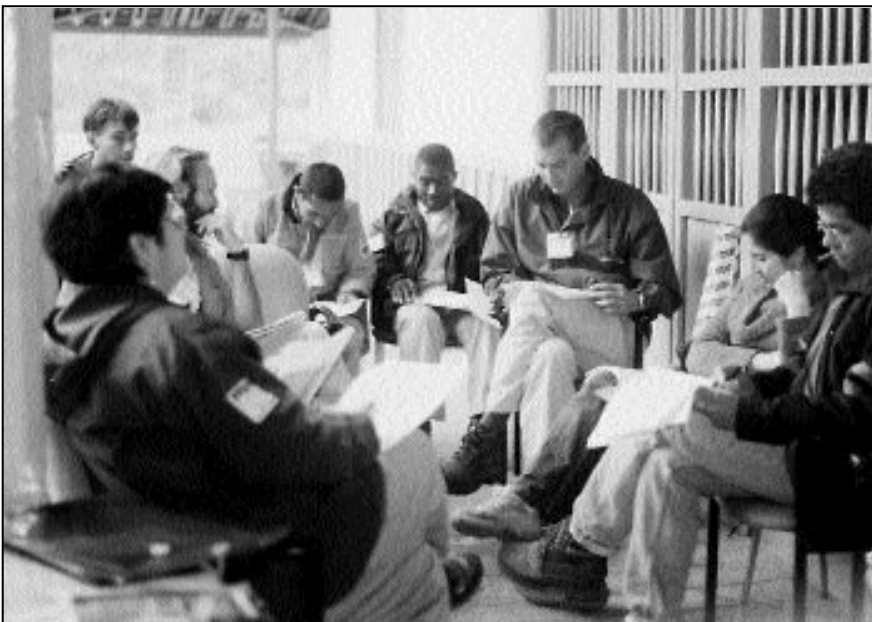
- Distribution records of tapir species in Colombia and the selection of priority areas for conservation, by Emilio Constantino, *Red de Reservas de la Sociedad Civil*
- Advances in molecular genetics and projections for the future, a short report sent by Dr. Manuel Ruiz, and presented by Franz Kastón, *Universidad Javeriana, Fundación APAS*
- Genetic aspects of the conservation of the genus *Tapirus* spp., a report by Javier Sarria *Universidade Estadual Paulista, Brazil* which was presented by Hugo López (*Universidad Nacional de Colombia*)
- The ecology of *Tapirus bairdii* in Costa Rica, by Charles Foerster. Tapir Project Leader, Costa Rica.
- *Tapirus bairdii* in Katios Natural National Park and its area of influence, by Héctor Restrepo, *Fundación Wii*.

- Home range and habitat requirements for *Tapirus terrestris*: - experiences from the Atlantic forest in Brazil, by Patrícia Medici, *Instituto de Pesquisas Ecologicas (IPE)*.
- Research overview and conservation priorities for *Tapirus pinchaque*, by Diego Lizcano, University of Kent.
- Conservation strategy for the woolly tapir in the region of Tolima, by Franz Kastón, *Fundación APAS*
- Tapir Specialist Group action perspectives for tapir conservation in the Neotropics, by Patrícia Medici, *Instituto de Pesquisas Ecologicas (IPE)*.
- Regional strategy and action plan for *Tapirus pinchaque* conservation at the Ucumari Natural Regional Park and Los Nevados Natural National Park, by Jaime A. Suárez, *Universidad Tecnológica de Pereira*.
- Mountain tapir in the Colombian eastern Andes, by Olga Montenegro. *Universidad Nacional de Colombia*
- An international project for mountain tapir conservation between the Cali Zoo and Los Angeles Zoo, by Jorge Gardezabal, Sérgio Sandoval and Carlos Valenzuela. *Zoológico de Cali and Zoológico de los Ángeles*
- The Ministry of Environment's policy framework concerning wildlife conservation, by Claudia Rodríguez. *Ministerio del Medio Ambiente, Colombia*
- Colombian Tapir Network, by Sérgio Sandoval  
Tapirs at the La Paya Natural National Park, a spontaneous presentation by Harley Morales. La Paya Natural National Park.

The aim of inviting the speakers was to present a useful and enriching background to the discussions regarding the National Programme for Tapir Conservation and Recovery in Colombia, a document whose preliminary version had been sent to all the participants in advance.

The second day of the workshop started with a brief overview of the contents and background of the document, presented by Olga Montenegro. The rest of the day was dedicated to the discussion of the proposed national programme. For discussions, participants gathered in four groups: (1) for *Tapirus bairdii* and the subspecies *Tapirus terrestris colombianus*, (2) for *Tapirus pinchaque*, (3) for *Tapirus terrestris terrestris*, and (4) for *ex situ* conservation. Each of the first three groups had representatives of the regional autonomous environmental agencies and national parks whose areas were within the respective species distribution. Research institutions and researchers joined the groups which most corresponded to their field of expertise. Zoos and Ministry of Environment representatives formed the *ex situ* conservation group.

The results of these discussions were presented in a plenary session on the third day and additional discussions were held at this time. Finally, the workshop ended with a synthesis of the meeting and concluding remarks. Suggestions for the National Programme for Tapir Conservation and Recovery in Colombia that resulted from this workshop will be incorporated in the document. The Colombian Ministry of the Environment will, in the following months, publish the final version of this national programme. It is



*Some of the participants in the mountain and lowland tapir discussion groups. From left to right: Stella Sarria, (Farallones de Cali National Park), Charles Foerster (TSG deputy-chair), César Rey (National Parks), Roberto Yepes (Katis National Park), Julio César Pérez (Utria National Park), Juan Camilo Restrepo (CORANTIOQUIA), Alba Morales (National University of Colombia) and Héctor Restrepo (Wii Foundation).*

*Photo by Olga Montenegro*

expected that the programme will be implemented as a joint effort with the environmental institutions, some of them through inter-institutional agreements. It was proposed that a follow-up workshop to review advances in the implementation of the programme might be held in two years.

The 1997 version of the Tapir Action Plan (TAP) of IUCN is presently being revised and it was proposed that the National Programme for Tapir Conservation and Recovery in Colombia, once published by the Ministry of Environment, could be incorporated into the updated version of the TAP as the chapter from Colombia

This workshop was organized by the Ministry of Environment (Ecosystem Sub-Direction) and the Natural Science Institute of the National University of Colombia. Partial logistic support was provided by the Special

Administrative Unit of Natural National Parks. Besides all those institutions mentioned earlier, attendees represented the following institutions: regional autonomous agencies (CARDER, CAM, CRC, CVC, CORTOLIMA, CRQ, CORPONOR, CORANTIOQUIA); national parks (Katiós, Utría, Farallones de Cali, Los Nevados, Las Hermosas, SFF Otún Quimbaya, Pisba, La Macarena-Tinigua-Picachos, La Paya, Amacayacu, Chiribiquete, Puinawai, Gestion and Tecnical Units), Zoos (Fundación Zoológico de Santa Cruz, Fundación Zoológico de Barranquilla, Zoológico de Matecaña) NGO's and research institutes (Fundación Natura, WWF Colombia, Instituto de Investigaciones Alexander von Humboldt).

**Olga Lucia Montenegro**

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## Current Project Updates

### **Baird's Tapir Project Corcovado National Park, Costa Rica**

*By Charles Foerster*

November 2002 will mark the 8<sup>th</sup> anniversary of the Baird's Tapir Project in Corcovado National Park, Costa Rica. Initiated by Charles Foerster for his field study towards a Master's degree in Wildlife Management, the primary goal of the project is to enhance tapir conservation programmes throughout Central and South America by providing detailed, reliable information on the ecology of an undisturbed, non-hunted population of Baird's tapirs. The underlying philosophy is that through a better understanding of how an intact tapir population functions, we will be better equipped to identify and correct irregularities in those populations altered by human activities.

The study is using radio telemetry and direct observation to document home range size, activity patterns, habitat use, reproductive rate, offspring and adult sex ratios, offspring survival, juvenile dispersal, spatial distribution, population density and mortality rates of a tapir population near the Sirena Biological Station in Corcovado. In all, 27 different tapirs have been radio-collared and monitored during the

study. Currently, Charles is collecting data on 17 animals (4 adult females, 6 adult males, 3 juvenile females, and 4 juvenile males) in a 6-km<sup>2</sup> area.

Some of the projects results to date include the following. Thirteen offspring have been born to 5 adult females with a sex ratio of offspring: 46% male, 38% female and 15% of unknown sex. The annual birth rate per female has been 0.51 offspring/year and the average interbirth interval has been 20.9 months. Annual home range sizes for adult males, adult females and juveniles have been 136, 122 and 113 hectares, respectively. The density of adult tapirs in the study area has averaged approximately 1.6 individuals/km<sup>2</sup>. On average the sex ratio of adult tapirs in the Sirena area has been 5 females (42%) to 7 males (58%).

As part of a larger project, Jim Norton, with the University of Illinois at Chicago, has been working on a genetic evaluation of the Sirena tapir population. Jim's work involves the initial assessment of genetic variability in wild and captive populations of Baird's tapirs. The results of Jim's project indicate that the tapir population in southern Costa Rica was most likely connected by gene flow to the population of tapirs in the Darien in Panama prior to fragmentation of habitat. It is most likely that the connection was indirect gene flow via intermediate populations that had probably



*Adult female (Big Mama) with a newly radiocollared female offspring (Prima). Photo by Charles Foerster*

spanned across Panama. In addition, the level of overall genetic variability detected across the entire sample was relatively low compared to the levels reported in other species of large mammals, although direct comparison between different species and different microsatellite loci does not provide really definite conclusions. Jim has also demonstrated the use of a sex chromosome specific genetic marker to identify the sex of tapirs with DNA extracted from hair root bulbs, providing a potential technique to collect population sex ratio data using non-invasively collected hair and faeces.



*Biopsy dart in the rump of a tapir (above), biopsy dart tip and the tissue sample collected (below). Photos by Charles Foerster*

As Jim finishes his thesis and prepares for his defence, we continue to discuss plans for future collaboration. Molecular genetic data has been used to investigate the mating systems, dispersal patterns, population structure and effective population sizes of species, like tapirs, that are difficult to study directly in the field. This is the type of work we hope to continue with tapirs. For example, one aspect we are particularly interested in is the mating system of the tapirs in the Sirena area. Home range

data over the past 8 years shows that a single “territory” is usually occupied by 1 adult male, 1 adult female and offspring from the previous 2 or 3 years. By itself, this could indicate a pair bonding type mating system, but that would be extremely unusual for a large mammal. In order to verify or discard this theory we will need to take a closer look at the parentage of the offspring. We are supplying Jim with tissue samples from all of the study animals and hope to determine the identity of the fathers. Analysing samples from a mother(s) and 2 or 3 of her calves may allow us to see if the same male or more than one is siring them.

In the coming year we also plan to expand our genetic analysis to the entire Corcovado National Park and eventually all of Costa Rica. Since we do not want to immobilize every individual to collect samples, we have been testing a biopsy dart (Palmer Cap-Chur Equipment) on our current study animals. After a few modifications we succeeded in taking viable samples and believe we are ready to start collecting from non-study animals when we have the funding and logistics figured out.

### New Projects

Two new projects were started this year: “Influence of Large Herbivores on Understorey Vegetation Structure and Diversity” and “Improving Existing Methods for Assessing Baird’s Tapir Populations.” Juan de Diós Valdez Leal, a graduate student in the Regional Wildlife Management Master’s Programme at the National University of Costa Rica will coordinate both projects for the first 6 months as part of his master’s thesis.

The first project will investigate the role large herbivores play in maintaining and shaping the plant communities of Neotropical forests. Specifically, we will examine how the removal of the large herbivores will affect the physical structure and floristic diversity of the understory vegetation in the lowland rainforest of Corcovado National Park. Many ecologists have documented the important roles played by large animals in seed dispersal, seed predation, herbivory, pollination, and predation, but until recently few have considered what would happen if the large animals were removed from the system. In order to simulate the removal of these herbivores from the forests, we will construct exclosures that will prevent them from foraging in selected areas and monitor changes over the next 5 years. The results obtained will provide additional insights into the ecological functions of these herbivores, which will enhance existing and future management plans.

In the second study we are investigating the possibility of using track counts to accurately estimate tapir population size. Unfortunately, due to the difficulties in working in tropical forest habitats and the secretive, nocturnal behaviour of the tapir, a reliable method for estimating the size of a tapir population does not currently exist. As a result, most management plans rely on track counts to estimate the relative abundance of tapirs in the area. Although useful, this method cannot provide an accurate measure of population size unless it is calibrated with data from an area of known tapir density. Similar problems and limitations apply to density estimates obtained with direct observations made along transects. Radio telemetry studies can provide very accurate population density measurements but are time consuming and expensive. This study will combine the accuracy of radio telemetry density estimates with the simplicity of transect methods to enhance the ability of wildlife managers to monitor tapir populations.

We will conduct monthly track counts and sightings along transects in the study area, very similar to what would be done in a conventional study. The difference in our case is that we know the true density of tapirs in our area. Therefore, we will be able to formulate a correlation factor that can be applied to the transect data to estimate population density. In addition, once a month we will radio-track the movements of each tapir during a continuous 24-hour period to describe the average daily movement patterns of the tapirs inhabiting the study area. Computer simulated transects will be applied to this telemetry data to help supplement our field data and refine the correlation factor.

### **Project updates available via e-mail**

Charles has begun to publish quarterly updates of the activities going on in the Baird's Tapir Project and is making them available via e-mail to those interested. The files are in MS Word format and are between 1.5 and 2 MB in size. Those interested in receiving the updates should e-mail Charles at [crfoerster@aol.com](mailto:crfoerster@aol.com) with "Project Update" in the subject line.

### **Charles Foerster**

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*Exclosure plot in a primary forest patch. Photo by Charles Foerster*

## **BOLIVIA**

### **Wet Season Lowland Tapir Habitat Preferences and Food Resource Use in Lowland Moist Tropical Forest**

*By Pamela Avila*

*(Wildlife Conservation Society – Bolivia)*

This undergraduate thesis study was realized as part of the Northwestern Bolivian Andes Landscape Conservation Programme during the wet season of 2000/2001 in the Tacana Indigenous Territory Demand and the adjacent Madidi National Park and Natural Area of Integrated Management. Tapir trail abundance was used as a measure of habitat preference across four lowland habitat types; sartenajal or swamp forest, seasonally humid Amazonian forest, and recent and established forests of the Beni alluvial plain. Comparisons between tapir trails and randomly established trails were used to examine tapir foraging behaviour and resource selectivity.

Tapir relative abundance was significantly related to resource availability in terms of the number of fleshy fruit patches and the number of forest clearings in a given habitat. Seasonally humid Amazonian forest was the most preferred habitat and was associated with elevated levels of fleshy fruit availability. Established Beni alluvial plain forest was the second most preferred habitat and was also associated with elevated levels of fleshy fruit availability as well as a greater frequency of forest clearings.

Turning angles along recent tapir trails were used to assess tapir foraging behaviour, as well as a comparison of the frequency of encounter for each resource between tapir trails and randomly placed trails. Tapirs fed mainly on fleshy fruits during the wet season in all habitats, particularly palm fruits. Preferred fruits were mainly either palms or from the Moraceae and Sapotaceae families.

During the wet season lowland tapirs fed mainly on abundant fleshy fruits across all four habitat types. However, this study recognizes that this pattern might shift to a more folivorous diet during the fruit scarce dry season.

**Pamela Avila**

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## Lowland Tapir Activity Patterns and Capture Frequencies in Lowland Moist Tropical Forest

By Rob Wallace, Guido Ayala and Humberto Gomez  
(Wildlife Conservation Society – Bolivia)

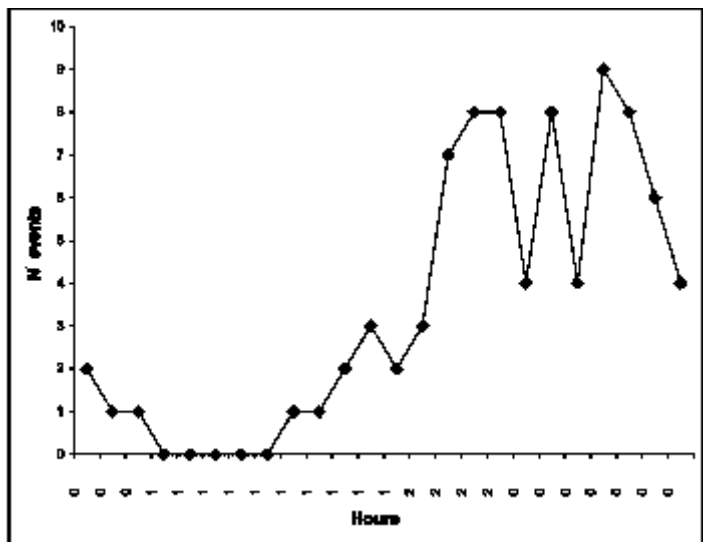
As part of the Northwestern Bolivian Andes Landscape Conservation Programme we conducted camera-trapping efforts in 2001 and 2002 designed for jaguar abundance and density estimates in the Tuichi and Hondo valleys of the Madidi National Park and Natural Area of Integrated Management. A total of 92 lowland tapir photographic capture events were obtained across two separate campaigns. These took place in August-October 2001 in a 47 km<sup>2</sup> study area in the Tuichi valley and July-August in a 146 km<sup>2</sup> study area spanning both the Tuichi and Hondo valleys.

We present preliminary data from camera trapping efforts and express the results as standard capture frequencies (number of captures per 1000 trap nights) for tapirs, comparing these with the other solitary ungulate in the area (see Table 1). We formally recognize the problem that these traps were set to target a species that might be expected to be actively avoided by tropical ungulates. According to these data lowland tapirs appear to be almost as commonly encountered as the red brocket deer (*Mazama americana*), although the fact that many camera traps were set along the beaches of forest streams and rivers probably leads to an inflated value for tapirs. In subsequent analyses we will compare only forest habitats.

**Table 1.** Camera trap capture frequencies for tropical ungulates in the Tuichi and Hondo valleys, Bolivia.

Species	Events	Capture Frequency
Lowland Tapir ( <i>Tapirus terrestris</i> )	92	7
Red Brocket Deer ( <i>Mazama americana</i> )	130	9.9

In addition, we present data on activity patterns - given that the date and time of each photographic event was recorded by camera traps (see Figure 1).



**Figure 1.** Activity Patterns for Lowland Tapir in the Tuichi and Hondo valleys, Bolivia.

Tapirs are clearly nocturnal animals in the Tuichi and Hondo valleys, although some diurnal activity is evident. Given that pre-1996 intensive hunting associated with logging activities in the area and current levels of ecotourism may still be influencing tapir activity patterns, similar studies in more remote areas may reveal more diurnal activity patterns. Nevertheless, these results have major implications for future population studies on lowland tapir suggesting that apart from relatively low natural abundance considerations, diurnal line transects may not be efficient at capturing primarily nocturnal animals.

**Robert B. Wallace**

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### Tapirs and Hunting in the Tacana Indigenous Territory

By Rob Wallace, Humberto Gomez and Maria Copa  
(Wildlife Conservation Society – Bolivia)

The Northwestern Bolivian Andes Landscape Conservation Programme is working with a number of local communities across the landscape towards the sustainable use of natural resources. We focus on community investigation projects requested by the community and much emphasis is placed on encouraging and facilitating true community participation in the management process, with the recognition that building a community decision making process is a long term activity.

This community project approach includes three Tacana indigenous communities situated along the Beni River who are working to document their hunting activities through a self-monitoring program. Tapirs are hunted in all three communities and provide a significant percentage of the wild meat consumed by the population.

Self-monitoring is considered a first step towards assessing the sustainability of this subsistence activity, and the communities have all recently decided to conduct line transect methodologies within their hunting grounds and in immediately adjacent source areas in order to assess the abundance of hunted wildlife and subsequently the sustainability of their hunting activities for different species. A major challenge will be the estimation of density for primarily nocturnal animals such as lowland tapirs and fixed width strip night transects might be the only feasible methodology available. Tapir productivity will also be examined in the near future through the collection and subsequent examination of reproductive tracts from hunted animals.

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### Tapir Ranging Behaviour and Activity Patterns in the Tropical Dry Forests of the Gran Chaco

By Guido Ayala  
(Wildlife Conservation Society – Bolivia)

The Bolivian Chaco is a major ecosystem and is now protected by the immense Kaa-Iya protected area and the adjacent Izoceño Indigenous Territory. Indigenous communities practice subsistence based hunting of many species including the lowland tapir (*Tapirus terrestris*), a particularly valuable target animal due to its relatively large size. Nevertheless, little information exists for this species in the Izozog or in the Gran Chaco in general, and this lack of data limits the capacity for the Kaa-Iya protected area administration and the Izoceño indigenous communities to manage lowland tapir populations.

In this study a total of five adult tapir (2 females and 3 males) were radio-collared and monitored for approximately one year at the Cerro Cortado research camp in the Izozog. A total of 2100 locations were collected using radio-telemetry triangulation techniques and activity patterns were assessed every 15 minutes by way of activity sensors within the radio-collars.

Average home range size for males was 281 ha and for females 218 ha (Minimum Convex Polygon 95%), with home range overlap evident between males and females but not between males. On the basis of home range data a preliminary density estimate of 0.5 ind./km<sup>2</sup> was calculated for the study site. Activity levels peaked between 01:00 and 06:30 hours, with very little activity between 11:00 and 15:30 hours. Tapirs are primarily nocturnal and crepuscular in the Bolivian Chaco.

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## News from the Field

### ■ CENTRAL AMERICA

#### Belize

### Central American Tapir Activity in Upper Macal and Raspaculo River Valley

By Sharon Matola

During the first ten days of June 2003, while investigating nesting activities of the Northern Central American Scarlet Macaw (*Ara macao cyanoptera*) a total of twelve tapirs (*Tapirus bairdii*) were observed in this remote river valley of the Maya Mountains of Belize, Central America.

On the third of June, a pair was observed mating. Approaching in a kayak, my field assistant, Eligorio Sho, and I heard what I know to be an “alarm” or “stress” call made by *T. bairdii*. We have 2 male and 1 female *T. bairdii* at The Belize Zoo and have heard this vocalisation occasionally.

The pair were mating in the water, in the shallow portions of the river, closest to the riverbank itself. The water level reached their shoulder in depth. They were oblivious to our quiet approach, and when finally sensing us, both left the river, went up the riverbank and in separate directions. We stayed for a while, but they did not return to the river.

Water appears to play a significant role in the natural history of *T. bairdii*. As far as I know, this is the only recording of a mating observation in the wild. However, if the Central American tapir does prefer water as part of the reproduction strategy, then this is an important idea to note as far as inducing breeding within a captive situation, i.e. providing water to encourage breeding behaviour.

It is important to note that this same river valley, the Upper Macal and Raspaculo in the Central Maya Mountains of Belize, would be flooded should the Chalillo Dam go forward. We are still awaiting the Supreme Court to reconvene in order to see what the next position will be on this. With so little quality habitat remaining for the species, this is critical habitat for *T. bairdii* in this part of their range.

Sharon Matola

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#### Honduras

### Notes on Baird's Tapir (*Tapirus bairdii*) from the Southern Region of Biosfera Tawahka–Asangni, Honduras

By Josiah Townsend

During July and August 2001 I took part in a herpetological survey of the border region of Biosfera Tawahka–Asangni in eastern Honduras. During the expedition some observations were recorded regarding the local occurrence of Baird's tapir (*Tapirus bairdii*). Evidence of tapir activity as well as the human exploitation of tapirs for meat was recorded at the following sites in Departamento Gracias a Dios: Casca Tingni, Quebrada de Dos Caras, Caño Awalwas, Cayrasa, Cueriadora and the mouth of Caño Awawas.

#### Region

We surveyed the environs of the Reserva de la Biosfera Tawahka Asangni (RBTA) in the remote region of eastern Honduras known as La Mosquitia. Formerly an anthropological reserve, RBTA was granted “biosphere” status in 1999 by the Honduran congress. We accessed the lowland tropical forest on the southern edge of the Biosphere via the Rio Coco Segovia, which in that area forms the boundary between Honduras and Nicaragua. The Nicaraguan side of the river is heavily deforested with a number of well-established towns made up mostly of indigenous Miskito and Tawahka peoples. The Honduran side of the river that lies within RBTA boundaries contains large tracts of intact primary forest, with only some minor deforestation on the periphery of the river. This stretch of forest continues nearly undisturbed north to the Rio Patuca, and many of the people living to the south report using this forest as their primary hunting grounds. The southern area of RBTA that we surveyed is relatively flat in comparison to the rugged



topography found in the north and west. All sites visited were less than 100m in elevation.

### Observations

Evidence of tapir activity was observed at six sites, all of which were within the department of Gracias a Dios and five of which are within the boundaries of RBTA. The observations reported herein were made by the author, Larry D. Wilson and James R. McCranie.

*Casca Tingni*: Primary forest surrounding an isolated homestead approximately 10 km north of the town of Awasbila. A small river (Casca Tingni), a forest lagoon, and two pebble-bottomed streams were located in the immediate vicinity. The residents had in their possession salted tapir meat that reportedly came from an animal shot in the nearby forest.

*Quebrada de dos Caras*: A narrow (ca. 2–3 m) but relatively deep (1–1.5 m) mud-bottomed creek that flows into the Rio Coco Segovia. The forest immediately surrounding the stream was highly disturbed, and contained dense stands of banana plants and bamboo. Fresh tapir tracks were seen in a muddy bank leading up out of the stream.

*Caño Awawas*: A slow-moving muddy stream that meanders through primary forest. An adult tapir was observed fleeing our approach through the forest during the daytime. Fresh tracks were also seen where the tapir apparently crossed the stream prior to or whilst making its escape.

*Cayrasa*: An area of pristine forest in the vicinity of a small, slow-moving river (Rio Almukwas). Tapir tracks were seen on a trail, as well as the tracks of an adult jaguar (*Panthera onca*), peccaries (*Tayassu sp.*), and an unidentified small cat.

*Cueriadora*: A large stream with some slow moving backwater areas flowing through primary and secondary forest into the Caño Awawas. Tapir tracks were seen leading up a game trail away from the stream.

*Mouth of Caño Awawas*: The area surrounding the confluence of the Awawas and Coco Segovia rivers is the site of rapid deforestation being carried out by a group of *campesinos* hired to clear land and establish a homestead for a rancher. They have cleared ca.100 hectares as of August 2001, and chainsaws were heard throughout our visit. This farm lies within, and actually helps to form, the southern boundary of RBTA. When we arrived at the farm, the resi-

dents were in the process of butchering a large tapir that had been freshly killed. Whether the tapir had been deliberately hunted down and killed or was the victim of a chance encounter is not known. The added pressure of hunting associated with the establishment of a large ranch in this area may be more than the local *T. bairdii* populations will be able to withstand.

### Recommendations

The lowlands of eastern Honduras are an area of Central America deserving of closer study from the scientific community. The isolation of this region that has helped to preserve its natural resources and has also made it difficult to access and conduct fieldwork. There are no roads connecting this region with the rest of Honduras, leaving rivers (the Patuca and the Coco Segovia) and small aircraft as the only methods of entry. Add to that inaccessibility, a nearly complete lack of government or police presence as well as the stigma associated with working so close to the Nicaraguan border, and the result is that relatively few biologists choose to work in this area. The documented occurrence of a number of Central America's endangered vertebrates, including the tapir, jaguar, giant anteater (*Myrmecophaga tridactyla*), American crocodile (*Crocodylus acutus*), harpy eagle (*Harpia harpyja*), great green macaw (*Ara ambigua*), and scarlet macaw (*Ara macao*), as well as a diverse flora and fauna that is roughly comparable to north eastern Costa Rica, make this previously neglected region a prime candidate for future study. Unfortunately, an increase in efforts to promote community based conservation and sustainable hunting and forestry practices is needed sooner rather than later if the forests of Tawahka-Asangni are to have a chance at surviving the pressure of a rapidly expanding human population.

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■ SOUTH AMERICA

**French Guiana  
Status of Lowland Tapirs  
(*Tapirus terrestris*) in French Guiana:  
A Preliminary Assessment**

*By Benoit de Thoisy & I. Vogel*

French Guiana is the smallest country of the Guiana shield. It belongs to and is administered by France. The Guiana shield is considered to be one of the largest remaining blocks of rainforest and approximately 90% of an area of French Guiana is still covered by moist, upland forest. However, the country is now facing a dramatic increase in human activity. As part of a large-scale study aiming to assess the status of primates in the northern part of the country, some preliminary data have been collected on the status of lowland tapirs (*Tapirus terrestris*) in French Guiana.

The main threat to the tapir in French Guiana is from hunting. The species is not legally protected and was classified in 1995 as one of 12 game species. Therefore it can be harvested and sold without any limits on numbers taken. In the southern part of the country, subsistence hunting occurs, but the main hunting pressure comes from illegal gold miners who are widespread on most of rivers and tributaries. In the north, logging activities result in clearings for hundreds of kilometres of tracks. Despite a very selective timber harvest, such easy access for hunters into large forested areas has dramatic consequences for large species. At the national level forested habitats are not fragmented, but no more than 3% of the country is under protection. Four of the 5 existing nature reserves have forested habitats, but the tapir is present in only 3 of them. The National Park project, which has been planned for 15 years, is now frozen possibly due to lobbying from the gold mining industry.

We assume that the tapir is still present in large areas of French Guiana but believe nevertheless, the direct harvest must be urgently restricted. Although it may not resolve the entire problem, the species must be legally protected. The tapir is regarded as the main game species by most local people, and as a result, the French government may be reluctant to pass legislation to restrict tapir hunting. In the northern belt, probably the more efficient way to reduce the hunting threat would be an improved optimisation and planning of logging activities. This may prevent laying

waste to suitable habitats, reduce access to pristine forest, optimise refuges, source areas, and corridors (de Thoisy *et al.*, 2001). The closure of tracks after logging would also allow population recovery in logged forests. In the south of the country, management and auto regulation by communities should be attempted, but external and uncontrolled pressure from gold miners may cause conflict. There may not be an optimistic outcome to these issues and thus for the conservation of the tapir and other game species and aquatic wildlife (otters, fish, carnivorous birds) unless the French government assumes its responsibilities in terms of conserving biodiversity within its territories.

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**Colombia**

**Conflict Between Mountain Tapirs  
(*Tapirus bairdii*) and Farmers  
in the Colombian Central Andes**

*By Jaime A. Suárez & Diego J. Lizcano*

In the last century the “Antioqueña” colonisation process transformed the Colombian Andean forest to cropland. This was predominantly in the form of coffee plantations, as coffee was the top Colombian export product in the 20<sup>th</sup> century. Simultaneously, cities like Ibagué, Armenia, Pereira and Manizales were founded on an economy based on coffee and thus dependent on the exploitation of natural resources. In the middle of the 20<sup>th</sup> century Pereira, the capital of Risaralda State, was the oldest coffee producer in Colombia. Due to the highest human population in the country, habitat fragmentation and loss increased. River levels diminished and demands for wild meat increased. For this reason the Ministry of Agriculture bought almost all the farms on the Otún river basin. These lands were

given to the municipality of Pereira and administered by Pereira's aqueduct company (Murillo and Baena, 1999). At the start of the 70's these lands and the surrounding areas in Quindio, Tolima and Caldas states were declared to be the "Los Nevados" (snow peaks) National Park with a total area of 38,000 ha. This area was increased to 58,000 ha in 1973. Nowadays this park has a population of 20 families who were living in the Risaralda area before the creation of the park. These families work in the area, growing potatoes and cattle ranching in the Paramo region.

"Los Nevados" National Park constitutes the northern limit of mountain tapir distribution in the central Andes of Colombia (Lizcano *et al.*, 2002). The altitude within the park varies from 2600 m in Risaralda to 5550 m at the peak of Mt. Tolima. Other mountain peaks are the Ruiz volcano, Santa Isabel and the Cisne. Two ecosystems predominate in the region. These are montane forest and the Paramo, which is the region above the tree line from 3700 m to the snowline at 4700 m. The vegetation in the Paramo is dominated by grassland with a few small trees which includes plants of the Espeletia genus (Smith and Young, 1987). At high altitude the forest canopy is 10-15 m and is dominated by *Weinmannia mariquitae*, *Frazieria* sp., *Rapanea ferruginea*, *Sauria scabra* and *Oreopanax* sp. At the lower altitude, vegetation is much higher (30-35m) and is dominated by *Brunellia goudotti*, *Miconia* sp., *Weinmannia* spp., *Nectandra* sp., and *Ocotea* sp. (Cleef *et al.*, 1983).



*Forest cleared to grow potatoes.*

*Photo by Jaime A. Suárez*



*Potato plant eaten by tapir. Photo by Jaime A. Suárez*

The forest is a mosaic of mature and secondary forests of different ages that originate from when farms were abandoned in the middle of the 20th century.

The "campesinos" or small farmers living inside the park owned their lands for many years before the creation of the park, when the "antioqueña" colonization process brought landless people to the region. However, because they actually live inside a national park they live under certain restrictions. For example, timber is restricted as building material, they have no access to bank loans to invest in crops, and hunting in the area is forbidden and penalized by the Ministry of Environment. In addition, they do not have electricity, water or sewage facilities and they are also obliged to pay an annual tax for their lands. The families living in this area use wood as fuel for cooking. An average family is composed of 6 people and consumes 20 kg of wood per day. This amount is the equivalent of one hectare of cleared forest per year (Verweij, 1995). The families in the park have cultivated potatoes for a long time, mainly because they do not have the knowledge to grow other crops. Each landowner owns an average of 60 cows. They use potatoes as their main food and cash crop and they supplement their diets with milk, cheese and other products acquired in the markets of Pereira. Pereira is an 8-hour journey by mule and another 2 hours by bus.

Conflicts between people and tapirs originates when the campesinos need to clear more forest in order to plant more potatoes. The tapirs, which frequent the cleared forest, eat the sprouting potato plants. As a result the campesinos lose their crops and consequently view the tapir as a problem. In 2002 two tapirs were killed for this reason.

Each time the tapir eats a crop of potatoes, the campesinos lose the money invested in the crop, their time spent planting and the money used to buy fertilizers and fungicides. For example, Mr. Rivera invested US\$60.00 in sowing potatoes last year, plus \$60.00 in fertilizer, plus \$15.00 in fungicides plus three months of work. But the tapir ate the crop. When a “campesino” wants to harvest 7 sacks of potatoes he has to invest \$65.00 in fertilizer, \$18.00 in fungicides and three months of work. When they harvest the potatoes they expect to collect 60 sacks each of which have a price of \$15.00 per sack. However, they also have to pay \$8.00 per sack for transportation (mule and bus) to Pereira. Their final profit is just \$337.00. Usually the price is \$15.00 per sack but sometimes the price is lower depending on the quality of potato and the abundance of potatoes at the market. Therefore the profit for the “campesino” is often less. Why doesn't the campesino cultivate other crops? They only have traditional knowledge for growing potatoes. They are unfamiliar with other products and they are cautious about experimenting with new crops that could fetch better prices. Additionally, the Colombian government does not have a policy of improving crop-raising techniques or teaching farmers about growing new crops such as quinoa (*Chenopodium* sp.) (Downer, 1997) or montane pineapple (*Banannas sativus*), Ulluco, Habas, which might have better success.

The campesinos have tried to resolve the problem of tapirs eating potato plants by putting scarecrows made of plastic materials in the fields, keeping dogs tethered in the fields and using smoke and sulphur vapours to drive out tapirs, without any positive results to date. They recognize that one of the best solutions would be to build new fences around the crops, but they do not have the money to buy barbed wire. Furthermore there are severe restrictions in the park regarding the use of wood to build fences within its boundaries. Another solution would be to build stone fences around the fields. This solution would require a lot of work but is very cheap and would not require the use of wood. Another possible solution to the problem is paying compensation for loss of crops to tapirs. We think it is important to involve the environmental and conservation organizations like CARDER, Pereira's Aqueduct Company and the Ministry of Environment Parks Office in the resolution of this problem because conflict solution requires strong partnerships, shared goals for both wildlife and human communities and shared responsibility. Each solution must be worked out on a case-by-case basis, to fit a unique set of ecological, cultural and economic circumstances. There is no universal panacea, but similar principles do apply to most problems.

### Acknowledgements

We would like to thank the people of Paramo Cortaderal, Silvia Castaño and Clemencia Gonzales for comments on an earlier version of this manuscript.

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**Brazil**

**Biology of a Lowland Tapir Population and Its Potential as a Community Involvement Agent in the Serra do Tabuleiro State Park, Santa Catarina State, Brazil**

*By Alexey Bevilacqua Tormin Borges and Eduardo Hermes Silva*

**Context**

The biology and status of the lowland tapir (*Tapirus terrestris*) in the state of Santa Catarina – southern Brazil – remains unknown. The last published sighting of the species was in 1992. Added to this, only 20% (16,541.79 km<sup>2</sup>) of the native Atlantic Rainforest still remains in the state. This suffers from human pressures and accelerated fragmentation.

In this context, the Serra do Tabuleiro State Park (STSP) can be singled out as a priority area for conservation purposes, not only for its area (900 km<sup>2</sup>) – representing 1% of

the remaining forest area in the state – but also for harbouring a variety of endangered species plus other species whose conservation status is as yet unknown. Amongst these is the lowland tapir. These facts, added to the amount and variety of threats, which the STSP is exposed to, were the main reasons that led us to pursue this line of research in the field.

**First Initiative – Fieldworker and Community Involvement**

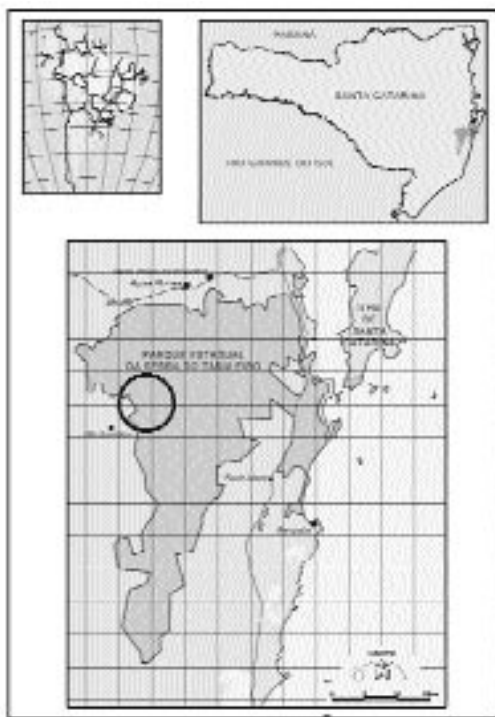
Besides biological research, the STSP lacks initiatives that focus on community involvement in conservation strategies. As such, the idea behind our first initiative regarding the STSP was to identify potential flagship species among the surrounding communities (there are 57 communities situated in the area and within the STSP). The singling out of a community plus ideas that arose in the field resulted in the structure of the first project. This project identifies the conflicts and potential affinities between local stakeholders and the STSP and, more importantly, the native fauna as indicated by them. This research consisted of collecting oral histories from local stakeholders between July and September 2001 and attempting to investigate and interpret not only the local situation but also the historical process by which this had evolved.

The results indicated that many of the conflicts originated from the threat that is posed by certain animal species to the agricultural processes undertaken by the local stakeholders. However, when there was no identifiable threat, there seemed to be potential affinities toward certain animal species, of an aesthetic and historical origin. The lowland tapir is among these potential representatives.

The conflicts and affinities were identified through the establishment of interpersonal ties, for which informality and compliance became the rule. This led to another important result: the recognition and respect of popular knowledge became fundamental in achieving compliance, as well as an invaluable tool in applying and planning for community involvement. The collection of oral history and the familiarity that developed during fieldwork with the local stakeholders constituted the first step in this direction.

**Second Initiative – Field Research and Ethno-biology**

Evidence of tapir footprints was found during field excursions directed towards zoning purposes in the years 2000 and 2001. They were located in the Conifer Tropical Forest nucleus of STSP at altitudes between 800 – 1,122 meters.



*Serra do Tabuleiro State Park and the study site (circled in black)*

This ecosystem occurs in isolation from the Conifer Tropical Forest of Santa Catarina State Plateau (80 km western of STSP), and represents the closest isolated formation of its kind near the Atlantic Ocean.

Systematic data of occurrence, distribution and habitat use by the lowland tapir population has been evaluated since October 2001, through the analysis of indirect evidence along 60 km of trails. This information is being compared with the conservation status of the observed habitats, altitude gradient and presence of seasonal components (seasons; conifer seeds).

The casts of tapir tracks along with some other species are being used to promote environmental sensibility within the community. This is a second example of valuing popular knowledge in the community. In family homes, the stakeholders gather around the casts and various ethno-biological information on lowland tapir (and other species) is reported. This approach seems to indicate that the casts may represent some kind of material evidence of lowland tapir occurrence (and existence). Most of this information will be documented by conducting questionnaire surveys with local stakeholders, and then comparing the results with field observations and related literature.

Other environmental education actions are being planned in conjunction with the municipal education board for the recognition of local needs for such initiatives.

We would like to finally emphasize that all these actions are being continually developed with the ultimate goal of providing sufficient local information and motivation for the development of a conservation strategy with the lowland tapir as a potential flagship species.

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## ■ ASIA

### Malaysia

We are very pleased to report on the commencement of this project on Malay tapir (*Tapirus indicus*) in Malaysia. The report was submitted by Bengt Holst on behalf of Carl Traeholt and relays the latest news on the project's progress and demonstrates extremely well the difficulties of tapir fieldwork.

#### Carl reports:

We completed four pitfall traps during the 14-16<sup>th</sup> of September. Since then we have had two near misses with tapir captures. In one case, a pitfall construction error was to blame since the tapir sunk into the ground 5 cm from the pitfall wall between the plywood wall and the soil. Obviously, he backed off again. This happened on the 27<sup>th</sup> September 2002, at the Bukit Renggit trap A.

In the second incident, a tapir partially fell into the pit. Its right legs broke through the trap doors whereas the left ones were still on solid ground. Somehow it managed to scramble out of this position, again without falling into the pit. This happened on the 28<sup>th</sup> September at the Bukit Renggit trap B and we repaired the trap the day after.

The last incident did not involve a tapir, but according to the two orang aslis that checked the pit, a tiger had voluntarily taken refuge in the pit at Jenut Baik (Baik Saltlick) during a rainstorm on the night of the 27<sup>th</sup>. It left the pit the next day whilst the aslis were observing it. They repaired the pit immediately.

According to the tracks around all four traps, it appears as if there is a waiting period of about 12-14 days for the trap to "settle" into the surroundings again. However, I have not been able to differentiate between the two sets of tracks that have been "near misses". The tracks from the incident of the 28<sup>th</sup> are not clear, as struggling and scraping is all that is evident, hence measurement is not possible. Therefore, I am not sure if the two incidents can be assigned to the same individual or to two different individuals. Since then, no new tracks have been observed near the pitfalls. I am positive that the individual(s) that had this bad "experience" at Bukit Renggit trap A and B have learnt a lesson and we cannot expect this/these individuals to make the same mistake again. There are signs that new paths are

being used to circumvent the old ones where the pitfall is located.

However, every morning there have been fresh tapir tracks near the small stream at a site the aslis call a salt lick at Bukit Renggit site. On Wednesday the 2<sup>nd</sup> of October, there were two tracks of adult individuals and one from a calf or very small adult.

If the pitfalls do not result in a positive outcome very soon then a change of strategy will have to be made. Hopefully success will soon come with the pitfalls.

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## News from Captivity

### New, Modernised Tapir House in Wuppertal Zoo, Germany

*By Stefan Seitz*

Wuppertal Zoo in Germany is the only breeding centre for Baird's tapir (*Tapirus bairdii*) in Europe. The zoo began with 2.1 individuals received from three US zoos in 1994 and 1996 (Kauffels, 1995), and a female offspring was born in 1998 (Schürer & Kauffels, 1999).

After hippos and elephants moved from the Pachyderm house, the whole area of four stables and a pool became available for tapirs. However, the listed historical building did not fulfil the demands for optimal animal management and wasn't attractive to the public. After one and a half years of reconstruction, the house re-opened to the public on 28 May 2002. Just an artificial tree trunk and rocks survived from 1927. Tiles replaced the broken concrete floor and glass replaced the old steel bars. The public area was supplemented with wooden benches and tropical plants. The stables were also improved in quality. The focal point of the new facility is the generously sized pool (6m long, 5m wide and 2m deep) with a bulletproof glass window (4m long and 2.3m high) that opens up an underwater view for visitors. As far as I know, this concept is a first for a tapir exhibit.

The Baird's tapirs like swimming and resting in the 24°C water, and children as well as adult zoo goers become more frequently attracted. When diving in the cloudy water, the animals are hard to detect, but the tapirs themselves can see and smell their audience and sometimes approach them at the window. Tapirs share the pool with 1.1 capybaras that inhabit a separate barn. Each animal gets access to the



*The tapir swimming pool with underwater viewing – a new attraction at the Wuppertal Zoo. Photo by Stefan Seitz*

water for about one hour per day. The zoo will soon begin the extension and modernisation of the smaller of the two outdoor areas, and hopes to continue breeding with two pairs of Baird's tapirs.

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*Hard to believe: This tapir is 36 years old. Lilith lives in the Wilhelma Zoo & Botanical Gardens in Stuttgart, Germany.*

*Photo by Volker Kruschenski*

## **New Longevity Record in Tapirs**

*By Stefan Seitz*

After achieving her 36<sup>th</sup> birthday on 1 June 2002, Lilith probably became the world's oldest tapir. The female Malay tapir (*Tapirus indicus*) was born in Nuremberg, Germany, in 1966 and was the second offspring of Schlappi and Josephine, two wild caught individuals from Thailand who started the captive breeding era in Europe. She moved to the Wilhelma Zoo in Stuttgart on 17 April 1968. She still lives there in the Hippo and Tapir House.

Separated from another pair of Malay tapirs, Lilith usually stays in the indoor stall which has a tiled floor and a shallow pool. The small outdoor area with natural earth substrate and grass is only used for occasional sunbathing. Although the female rests most of the time, she is in a surprisingly good physical state. She moves about well and her skin and hair look healthy. Her sense of smell is very sensitive, which probably compensates for her dramatically reduced eyesight. Her head keeper, Volker Kruschenski, reported that she has lost only a few molar teeth, so is still able to chew whole apples. Volker feeds her a normal diet that consists of fruits, vegetables and pellets. There are no added supplements or medication. Lilith's only offspring, Lydia, died at the age of 23.

There is no record of any tapir over the age of 36. Longevity in Malay tapirs is documented at some 35 years; a female from Bangkok, Thailand, lived for 30 years in the San Diego Zoo, California, USA and gave birth to 15 calves (Barongi, 1998). A male lowland tapir, in Wroclaw Zoo, Poland, reached the age of 35 (Smielowski, 1979). The oldest known Baird's tapir (*Tapirus bairdii*), a wild-born male from San Diego Zoo, died at some 29 years (Sheryl Todd, pers. comm.). The Wilhelma Zoo in Stuttgart, Germany, also holds the record for a female mountain tapir that was imported from Ecuador and reached the age of at least 28 (Holtkötter, 1998).

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## Contributed Article

## Population Ecology and Conservation of Baird's Tapir (*Tapirus bairdii*) in the Lacandon Forest, Mexico

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### Abstract

Baird's tapir (*Tapirus bairdii*) has an important role in the dynamics of tropical forests through herbivory, seed dispersal, and seed predation. This mammal has also been a food source for rural inhabitants of Mesoamerica. Tapirs are currently endangered due to habitat loss and over-hunting. The objectives of this study were: (1) to evaluate the status of the tapir population in Montes Azules Biosphere Reserve (MABR) and its surroundings in the Lacandon Forest of Chiapas, Mexico; and (2) to propose a strategy for the conservation and management of tapirs in collaboration with residents of the study area. We walked 1908 km of line transects in the study area to count tapirs and their tracks. We interviewed 232 local hunters and had meetings with local communities to discuss our results. We observed 19 individuals and 438 tapir tracks between May 1998 and April 2001. Most tapir records (79.3%) were obtained in slightly hunted sites within MABR and only 0.4% were found outside this protected area. We estimated an overall encounter rate of 0.9 tapirs/100 km and a density of 0.22 ind/km<sup>2</sup>. Average density estimated in slightly hunted areas (0.24 ind/km<sup>2</sup>) was considerably higher than density of persistently hunted areas (0.05 ind/km<sup>2</sup>). We estimated a two-month home range of 0.67 km<sup>2</sup> for a radio-collared female tapir. The sex ratio based on hunting records at persistently hunted sites did not differ from the expected 1:1. From direct sightings, we estimated that the tapir population was composed of 78.9% adults (n=15), 15.8% juveniles (n=3), and 5.3% young (n=1). Using the production and the harvest models, we detected unsustain-

able hunting of tapirs at both regional and local levels in the study area. Through the stock-recruitment model, we estimated the status of the hunted tapir population at 21% of K. In order to promote tapir conservation in the study area, we recommend: (1) to protect remaining habitat within and outside existing reserves; (2) to encourage self-regulation of subsistence hunting by local communities; (3) to look for alternative sources of income for local people (e.g. tourism, and agro-forestry projects); (4) to establish environmental education and wildlife research programmes around MABR.

### Introduction

Among the numerous wildlife species used by rural inhabitants of Mesoamerica, Baird's tapirs (*Tapirus bairdii*) are notable because of their meat yield and the usefulness of their skins. Apart from representing food resources for rural people, these mammals play an important function in the dynamics of tropical forests through the processes of herbivory and the seed dispersal of many plant species. However, as is the case with other large tropical mammals, Baird's tapir populations are particularly vulnerable to local extinction triggered by habitat loss and over-hunting (Naranjo, 2002). Baird's tapir is listed in CITES Appendix I, and is regarded as "vulnerable" and "endangered" by IUCN (2001) and SEMARNAP (2000), respectively. It is very likely that both the Lacandon Forest of Chiapas and the region of Calakmul, Campeche, shelter the largest Mexican population of tapir. Several conservation areas have been created in the Lacandon Forest (Figure 1). However, little has been done to promote wildlife management and conservation in and around such areas. Because of its large size and the diversity of its natural and cultural resources, Montes Azules Biosphere Reserve (MABR; 3,300 km<sup>2</sup>) represents a very interesting study area for conservation scientists. In spite of this, quantitative information on the status of local wildlife populations is very scarce. Two recent, general assessments of wildlife use in the Lacandon Forest (March *et al.*, 1996; Naranjo *et al.*, 1997) revealed that tapirs are still locally hunted even within protected areas. In this study we obtained basic information on the status of tapir populations in the Lacandon Forest. This information was used to design a conservation strategy incorporating the sustainable use and monitoring of the species in collaboration with local people. The resulting strategy may be useful to conserve a wider array of



Figure 1. Study sites in the Lacandon Forest of Chiapas, Mexico.

game and non-game species with similar habitat requirements to those of the tapir (i.e., brocket deer, white-lipped peccaries, primates and cracids).

### Study Area

The Lacandon Forest (16°05'–17°15' N, 90°30'–91°30' W) is located in the northeastern portion of the state of Chiapas, Mexico, and is delimited by the Guatemalan border on the east, north, and south and by the Chiapas Highlands to the west. Average monthly temperatures range from 24°C to 26°C with maximum and minimum values in May (28°C) and in January (18°C), respectively. Mean annual rainfall is 2500–3500 mm, with roughly 80% of rainfall occurring between June and November. The area was originally covered by over a million hectares of rainforest, of which about half remains today (INE, 2000; Naranjo, 2002). Among the protected areas extant in the Lacandon Forest, Montes Azules Biosphere Reserve (MABR) is the largest with over 3,300 km<sup>2</sup>, and harbours some of the largest Mexican populations of precious hardwood trees and large vertebrate species which are harvested by both Indian and Mestizo residents (Medellín, 1994; Vásquez & Ramos, 1992).

The interior of MABR is primarily covered by tropical rainforest (*selva alta perennifolia*), while the community lands show a mosaic of rainforest fragments surrounded by secondary vegetation, pasturelands, seasonal crops (corn, beans and chilli peppers), and cacao plantations (Castillo & Narave, 1992). A complete inventory of the fauna of the Lacandon Forest has not been undertaken. However, 67 fish, 23 amphibians, 54 reptiles, 341 birds and 116 mammals have been recorded in the area (INE, 2000; March *et al.*, 1996). The human population of the area is composed of several ethnic groups of Mayan descent (Lacandon, Tzeltal, Tojolabal, Chol), and Spanish-speaking Mestizos. Except for the Lacandon, most of the local residents have emigrated from either the Chiapas highlands or from other Mexican states within the last 30 years.

### Methods

#### Distribution and Abundance

From May 1998 through April 2001 we recorded tapirs and their tracks along 1,908 km of line transects established at two slightly hunted sites and two persistently hunted sites within Montes Azules Biosphere Reserve (MABR), Chiapas, Mexico. We walked transects during the first and the last hours of daylight, usually 7–11 AM and 4–7 PM, at a slow pace (about 1.5 km/h). We recorded the number of individuals seen, their perpendicular distance to the centre line of the transect and the numbers of tracks and/or faecal groups found in all the transects (Southwell, 1996). We estimated the encounter rate (number of individuals, groups or tracks/100 km) for every site, year, and season (Conroy, 1996). In addition, we assessed tapir population density (number of individuals or groups/km<sup>2</sup>) through distance sampling (Buckland *et al.*, 1993), using the computer software DISTANCE 3.5 (Thomas *et al.*, 1998).

#### Home Range

We captured a female tapir using a pitfall trap measuring 2.20 x 1.50 x 2.0 m (Médici & Valladares, 1997). We covered the trap with 4 mm-thick asbestos sheets and a uniform layer of fallen leaves. We placed small amounts of bananas, mangoes and native fruit in the trap. Once the trap was set, it was checked every morning. When the tapir was caught, it was immobilized with a mixture of butorphanol hydrochloride (40 mg) and xylazine hydrochloride

(200 mg). Once the tapir was sedated, we fitted a radio-collar (Telonics Inc., mod. 500) around her neck, and then estimated her age class, weight, and reproductive condition. We also measured her total length and took tissue samples for future genetic analysis. After recovering, the tapir was allowed to escape by digging on one of the corners of the trap to reduce its depth. We radio-tracked this tapir from fixed stations located along the transects established within MABR. We assessed its home range using Kernell's method and the Minimum Convex Polygon (MCP) estimator with 95% of localizations (White & Garrott, 1990).

### Population Structure

We estimated age classes and sex ratios from direct sightings and hunting records. Age categories considered were: (1) Young (small individuals accompanied by their mother and with white spots and stripes); (2) Juvenile (solitary individuals with or without vestiges of white spots or stripes, but clearly smaller than adults); and (3) Adult (large animals without stripes or spots, with very little hair on the rump; Montenegro, 1998). We additionally examined tooth wear and eruption from skulls kept by local hunters (Dimmick & Pelton, 1994). All skulls donated by hunters were deposited in the mammal collection of Ecosur at San Cristobal de Las Casas, Chiapas, Mexico.

### Hunting Sustainability

We interviewed 232 residents of five localities (Bethel, Flor del Marqués, Lacanjá-Chansayab, Nueva Palestina and Playón de la Gloria). We questioned residents of the study area about their use of tapirs and other wildlife species, as well as the methods, instruments, seasons and sites where they hunted. From these data we assessed annual harvest rates (individuals hunted/km<sup>2</sup>/year). We applied the unified harvest model (Bodmer & Robinson, in press) to evaluate the hunting sustainability of tapirs in the Lacandon Forest. This model uses data on actual productivity, harvest rates, and population densities in slightly and persistently hunted sites to construct a graph that displays a vertical bar representing the status of hunted populations with respect to their  $K$  (x-axis), and with respect to their corresponding  $MSY$  (y-axis) (Bodmer, 2001; Bodmer & Robinson, in press). We assumed that a population was being harvested sustainably and safely if its vertical bar was well under its corresponding curve representing  $MSY$  (i.e. harvest did not exceed production), and on the right side of the graph ( $N$  approached to  $K$ ; Bodmer, 2001).

## Results and Discussion

### Population Density and Abundance

We observed 19 individuals and 438 tapir tracks during the study. Most records (79.3%,  $n=380$ ) were obtained in slightly hunted sites within MABR, and only two tracks (0.4% of all records) were found outside this protected area. We estimated an overall encounter rate of 0.9 tapirs/100 km and an overall population density of 0.22 ind/km<sup>2</sup> (Table 1). Density was almost five times greater in slightly hunted (0.24 ind/km<sup>2</sup>) than in persistently hunted areas (0.05 ind/km<sup>2</sup>). Similarly, tapir track frequency was considerably higher in persistently hunted than in slightly hunted sites (Mann-Whitney's  $U=1119.5$ ;  $d.f.=1$ ;  $P=0.047$ ; Table 1). We did not detect significant variations in densities or track frequencies among years, months or between seasons ( $P>0.05$ ).

Our estimates of Baird's tapir abundance in the Lacandon Forest are similar to those obtained in La Sepultura, Chiapas (Cruz, 2001; Naranjo & Cruz, 1998). However, tapir density was lower in our study area than in Corcovado National Park, Costa Rica (Foerster, 1998; Naranjo, 1995), but higher than in Honduras (Flesher, 1999) and Belize (Fragoso, 1991). Our estimates suggest that the status of tapir populations in slightly hunted and non-hunted sites of the Lacandon Forest is good. Yet, the situation is noticeably different at persistently hunted sites inside MABR, and especially outside this protected area. Tapirs have very low reproductive productivity (Eisenberg, 1989) and their populations do not recover easily from an intense or even a moderate harvest rate (Bodmer, 1995). In addition, because of its habitat requirements, this mammal is sensitive to habitat fragmentation and other effects of human activity (e.g., noise, odours, dogs and cattle; Matola *et al.*, 1997; Naranjo & Cruz, 1998). In persistently hunted sites, habitat transformation and forest fragmentation combined with over-hunting have driven tapir populations to the point of near-extinction.

### Population Structure

During the study we observed 78.9% adults ( $n=15$ ), 15.8% juveniles ( $n=3$ ), and 5.3% young ( $n=1$ ). We were able to identify the sex of 14 of the 19 individuals observed. We saw eight females (42.1%), six males (31.6%), and five unidentified animals (26.3%; Table 2). The female-male ratio did not differ from the expected 1:1 (57.1: 42.9 %, respectively).

From our hunting records, we observed that the proportion of young tapirs was higher in persistently hunted than in

Table 1. Relative abundance (encounter rates) and densities of Baird's tapir in the Lacandon Forest, Mexico (1998-2001).

Variable	Slightly hunted sites	Persistently hunted sites	Overall
Distance travelled (km)	1308.9	586.2	1908.1
Number of tapirs seen	16	3	19
Population density (ind/km <sup>2</sup> ± SE)	0.24 ± 0.09	0.05 ± 0.04	0.22 ± 0.12
Encounter rate (tapirs/100 km)	1.22	0.50	1.00
Number of tracks found	381	87	438
Encounter rate (tracks/100 km)	27.58	14.54	22.95

Table 2. Age structure and sex ratios of Baird's tapir estimated through three different techniques in the Lacandon Forest, Mexico (1998-2001).

Technique	♀ : ♂	Unknown	Young and juveniles		Adults		Total
	n		n	n	%	n	
Direct sightings	8 : 6	6	4	21.1	15	78.9	19
Collected skulls	?	3	2	66.7	1	33.3	3
Interviews	3 : 2	0	1	20.0	4	80.0	5

slightly hunted sites ( $\chi^2=13.4$ ;  $df=1$ ;  $P=0.0002$ ). If hunters were not selective towards the largest animals within each population, then our data would reflect the actual age structure of persistently hunted populations, suggesting a probability that source-sink systems are functioning for tapirs (Naranjo, 2002). Considering the vulnerability of tapir populations to hunting (Bodmer *et al.*, 1997), immigration of individuals from slightly hunted areas of MABR would be a key factor in maintaining the persistently hunted populations in the Lacandon Forest.

### Home Range and Movements

The two-month home range of a 200-kg adult female tapir was estimated at 0.67 and 0.22 km<sup>2</sup> using Kernell's and the Minimum Convex Polygon estimators with 95% of localisations ( $n=10$ ), respectively. The number of localisations obtained for this female was very small, probably because she was not a resident of the capture site. After the last localisation, we unsuccessfully tried to locate her signal in a radius of about 10 km for several months. Dispersing tapirs have been observed moving over 20 km in a few days to establish a new home range in the rainforest of Corcovado National Park, Costa Rica (Foerster, 1998). This could have been the case with our female tapir in the Lacandon Forest, even though she was the first radio-tracked individual of this species in Mexico.

Other information on tapir movement includes the observation, made on several occasions, of fresh tapir tracks coming out of the water in forest fragments outside MABR. Local fishermen and riverside dwellers confirmed this observation by describing occasional sightings of tapirs swimming across the Lacantún River towards community lands during the dry season, when the waters are calm, clear, and shallow. Dispersing tapirs coming from MABR are probably attracted by fruiting trees and forage growing in large forest patches across the river. However, we did not have observations or references of tapirs crossing the Lacantún River from community lands to MABR. This might be an indicator that MABR could indeed function as the source of individuals taken by hunters from neighbouring communities.

### Hunting Sustainability

Harvest/Production ratios (H/P) estimated for tapir populations in the Lacandon Forest are shown in Table 3. Under the unified harvest model (Bodmer and Robinson, *In press*), Baird's tapir appeared to be over-hunted in the study area. However, a further analysis revealed that tapirs were actually over-exploited in the Tzeltal community of Nueva Palestina, one of the largest settlements in the region (Table 3, Figure 2). Tzeltal hunters took a little more than 100% of P, while Lacandon hunters extracted only 15% of P, and Mestizo hunters did not take tapirs at all.

**Table 3.** Sustainability of tapir hunting by three ethnic groups in the Lacandon Forest through the unified harvest model (Bodmer and Robinson, in press).

Variable	Lacandon	Tzeltal	Mestizo	Overall
Production (P; ind/km <sup>2</sup> ) <sup>a</sup>	0.007	0.007	0.007	0.007
Harvest Rate (H; ind/km <sup>2</sup> )	0.001	0.007	0	0.003
H/P	0.15	1.00	0	0.44
Sustainable? <sup>b</sup>	Yes	No	-	No
Carrying capacity (K; ind/km <sup>2</sup> ) <sup>c</sup>				0.24
Density of hunted population (D; ind/km <sup>2</sup> )				0.05
D/K * 100				20.8
Status				Risky

<sup>a</sup> Based on actual densities estimated in the Lacandon Forest and reproductive data from R.E. Bodmer (Personal communication).

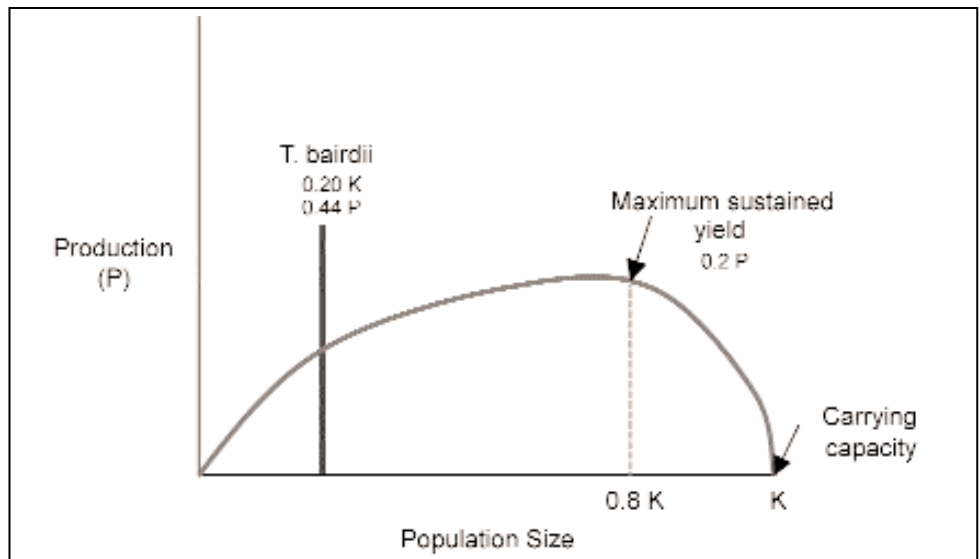
<sup>b</sup> A sustainable harvest of tapirs should be lower than 20% of population production (H/P < 0.20; Bodmer, 1994).

<sup>c</sup> It is assumed that populations are at their carrying capacity (K) in non-hunted sites. Therefore, tapir density estimated in non-hunted sites is used as K.

The causes of these variations may be related to the geographical, cultural, and socio-economic contexts of hunters and their communities. Tzeltal hunters of Nueva Palestina (n=850) by far outnumbered Lacandon and Mestizo hunters combined (n=140), and used a larger catchment area than the other two ethnic groups. This implied that Tzeltal hunters had a higher probability of finding a tapir in their home ranges than Lacandon and Mestizo hunters. On the other hand, most Lacandon hunters interviewed in this study said that they did not like to hunt tapirs because they are too heavy and too bulky to transport back to their homes. Mestizo hunters, on their part, did not harvest tapirs basically because these mammals are rarely found in

their community lands. In spite of this, the unified harvest model allowed us to infer that on a regional scale, tapir populations in hunted areas are at only 21% of K, which means that they could have been decimated by hunting in the study area (Table 3, Figure 2). Interestingly, the analysis of interviews with local hunters showed us that hunting pressure on tapirs has been relatively low during the last decade in the Lacandon Forest. In fact, the tapir does not appear within the top ten hunted species in the study area (Naranjo, 2002). However, the status of this ungulate does not appear hopeful on a more local scale: it has become extremely rare in most community lands outside MABR.

**Figure 2.** Unified harvest model showing the sustainability of hunting and status of Baird's tapir populations at persistently hunted sites of the Lacandon Forest, Mexico. Note that the vertical bar representing the hunted tapir population is on the left side of the x-axis, denoting a very low density with respect to K. Meanwhile the bar is considerably higher than the MSY curve, which implies that hunting on this mammal is far from sustainable in the study area (Bodmer, 2001).



### Conservation Proposal

We organized workshops on sustainable hunting in the communities visited during the study. In addition to our own results, we also incorporated most of the suggestions made by residents of the Lacandon Forest in the conservation proposal presented below.

#### Habitat Protection

Large-sized, charismatic species requiring an extensive mosaic of habitat types can function as “flagships” and/or “umbrellas” for the conservation of entire communities and even ecosystems (Entwistle & Dunstone, 2000). Considering its size, habits and habitat requirements, Baird’s tapir could represent such a species in the Lacandon Forest. Consequently, planned actions to conserve Baird’s tapir populations can be beneficial for many other wildlife species in the area.

It is essential to maintain the most important protected areas in the Lacandon Forest (Montes Azules, Lacantún, Chankín, Yaxchilán and Bonampak) to ensure the long-term persistence of tapir populations. Connectivity amongst those reserves is also a relevant factor to allow for genetic flow between local populations. In this sense, we believe that it is extremely important to avoid further deforestation in the area known as Sierra de la Cojolita, which connects Montes Azules-Lacantún-Bonampak with the Yaxchilán and Chankín reserves. The latter reserves in turn favour the eventual dispersal of tapirs and many other species towards the rainforests of northern Guatemala (Figure 3). The creation and maintenance of smaller community reserves around MABR should be considered as valuable components for the conservation strategy of wildlife habitat. In spite of their relatively small size, these reserves may function as corridors that facilitate animal transit from, and to, larger and better areas for the survival of tapirs and many other terrestrial vertebrates.

Perennial water bodies are crucial elements in tapir habitat. Rivers and streams are particularly important not only as water sources, but also as suitable habitat for this mammal. The preservation of wide vegetation strips along tributary streams of main rivers (Usumacinta, Lacantún and Lacanjá, among others) will be favourable for the movement and foraging of tapirs and other herbivores.

### Hunting Regulation

Residents of communities around MABR let us know during the workshops that tapirs represent interesting, charismatic and rare species for them. Therefore, they themselves, have recently discouraged tapir hunting on their lands, although this study did find over-hunting of this species in that area. On the other hand, local people regarded peccaries, deer, pacas, and other mammals as important game species that should be managed to increase their harvest. After researching the viewpoint of the local people, we deem it necessary to promote community organisation to regulate subsistence hunting. This organisation may be initiated through the election, by the residents themselves, of small “wildlife committees” to establish and encourage hunting regulation.

We propose that subsistence hunting may be regulated through land planning in each community. Hunting of vulnerable species such as the white-lipped peccary (*Tayassu pecari*), great curassow (*Crax rubra*), black guan (*Penelope purpurascens*), and parrots (*Amazona* spp.), may be temporarily or definitively banned (Table 4). A complementary strategy may consist of establishing har-

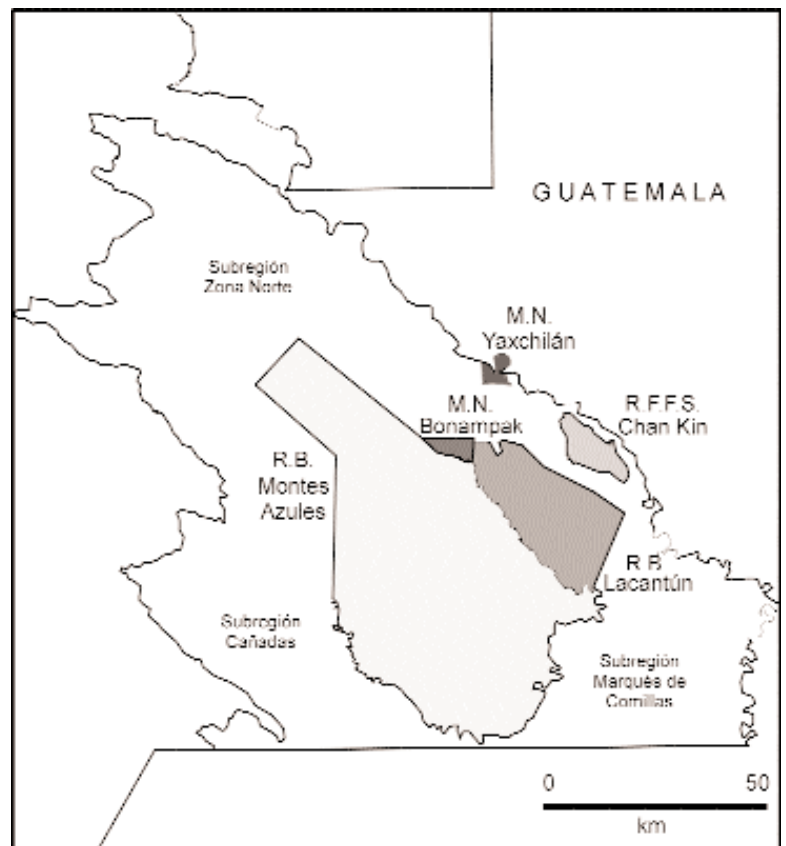


Figure 3. Protected areas of the Lacandon Forest, Mexico.

Table 4. Proposed strategies for sustainable use and protection of game mammals and birds in community lands of the Lacandon Forest, Mexico.

Permanently banned hunting	Spatially regulated hunting	Numerically regulated hunting
<i>Alouatta pigra</i>	<i>Tayassu pecari</i>	<i>Agouti paca</i>
<i>Ateles geoffroyi</i>	<i>Amazona</i> spp.	<i>Dasypus novemcinctus</i>
<i>Panthera onca</i>	<i>Crax rubra</i>	<i>Mazama americana</i>
<i>Leopardus pardalis</i>	<i>Fenelope purpurascens</i>	<i>Odocoileus virginianus</i>
<i>Leopardus wiedii</i>		
<i>Tapirus bairdii</i>		
<i>Ara macao</i>		

vest quotas for species more tolerant to hunting, such as the paca (*Agouti paca*), nine-banded armadillo (*Dasypus novemcinctus*), collared peccary (*Tayassu tajacu*), red-brocket deer (*Mazama americana*), white-tailed deer (*Odocoileus virginianus*), and tinamou (*Tinamus major*). In regard to threatened species such as tapirs, primates, wild cats and scarlet macaws, we recommend a definitive ban on hunting in community lands (Table 4).

### Environmental Education

We are convinced that local people constitute an essential component in the conservation of natural areas. Many residents of the study area made it clear that they are not concerned about maintaining protected areas and their species because they do not perceive any tangible benefit from such preservation. Therefore, we believe it essential to promote awareness about the potential benefits of natural areas and biodiversity among residents.

### Economic Alternatives for Local People

As residents of areas inhabited by tapirs get more and better sources of income, they will probably develop a better attitude towards projects and programmes related to wildlife sustainable use and conservation. In this sense, some locals can be hired and trained as conservation promoters within their own communities instead of sending employees from the city. These promoters may in turn form part of the “wildlife committees” described above in order to help encourage wildlife management on their own land. In addition, several residents of communities around MABR have been employed for several years as field assistants in research projects conducted in the area (four people in our own project). This alternative could be encouraged by both the federal Wildlife Office (Dirección General de Vida Silvestre-INE) and the reserve authorities when institutions apply for research permits.

The Lacandon area has great potential for alternative tourism (i.e. “ecotourism”) because of its wildlife and its scenic and archaeological richness. Tapirs, in particular, seem to be a very attractive species for nature-oriented tourists. Interested persons, groups, or even communities might be advised and trained to apply for their own credits or grants from government agencies or NGO’s to initiate ecotourism or some other kind of environmentally sound project, such as agroforestry, around existing reserves.

### Research and Monitoring

Scientific research and monitoring are fundamental for designing viable conservation strategies. We specifically recommend promoting research on the hunting sustainability and status of threatened game species in the northern (Zona Norte) and western (Cañadas) sectors of MABR, as well as in its neighbouring reserves: Lacantún, Chankín, and Yaxchilán. Additional research topics relevant for tapirs include their response to habitat fragmentation and human activities such as selective logging, extraction of non-timber products (i.e. *Chamaedorea* spp. and *Aechmea* sp.), traditional agricultural practices and road construction.

### Acknowledgements

This study was supported by the U.S. Fish and Wildlife Service, The Mexican National Commission for Biodiversity (CONABIO), The Mexican National Council of Science and Technology (CONACYT), The Compton Foundation, The US Man and Biosphere Program (MAB), and Idea Wild. El Colegio de la Frontera Sur (ECOSUR) facilitated infrastructure, vehicles and logistic support at all times. The Dirección General de Vida Silvestre-INE and the staff of Montes Azules Biosphere Reserve allowed us permission to carry out this project. Conservation

International (Chiapas Chapter), the University of Florida, the Universidad de Ciencias y Artes de Chiapas (UNICACH) and the communities of Playón de la Gloria, Flor del Marqués, Reforma Agraria, Adolfo López Mateos, Nueva Palestina, Bethel and Lacanjá-Chansayab collaborated with us in different ways. We especially give thanks to Jorge Bolaños, Carlos Muench, Michelle Guerra, Rausel Sarmiento, Isidro López, Romeo Jiménez, José A. Jiménez, Celedonio Chan, Germán Hernández, Antonio Navarro Chankín, Pascual Pérez, Miguel Muñiz and Miguel Martínez Icó.

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## IUCN/SSC Tapir Specialist Group Membership Directory

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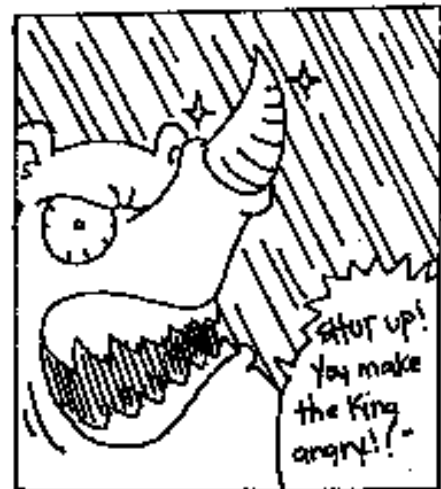
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# MALAYAN TAPIR STORY Siti Khadijah



The aboriginal Jahut people at Krau Wildlife Reserve, Malaysia, tell a story about the origin of Malay tapirs that is drawn and translated by Shamsul & Siti Khadijah Abd Ghani, E-mail: cobra7512081@hotmail.com

