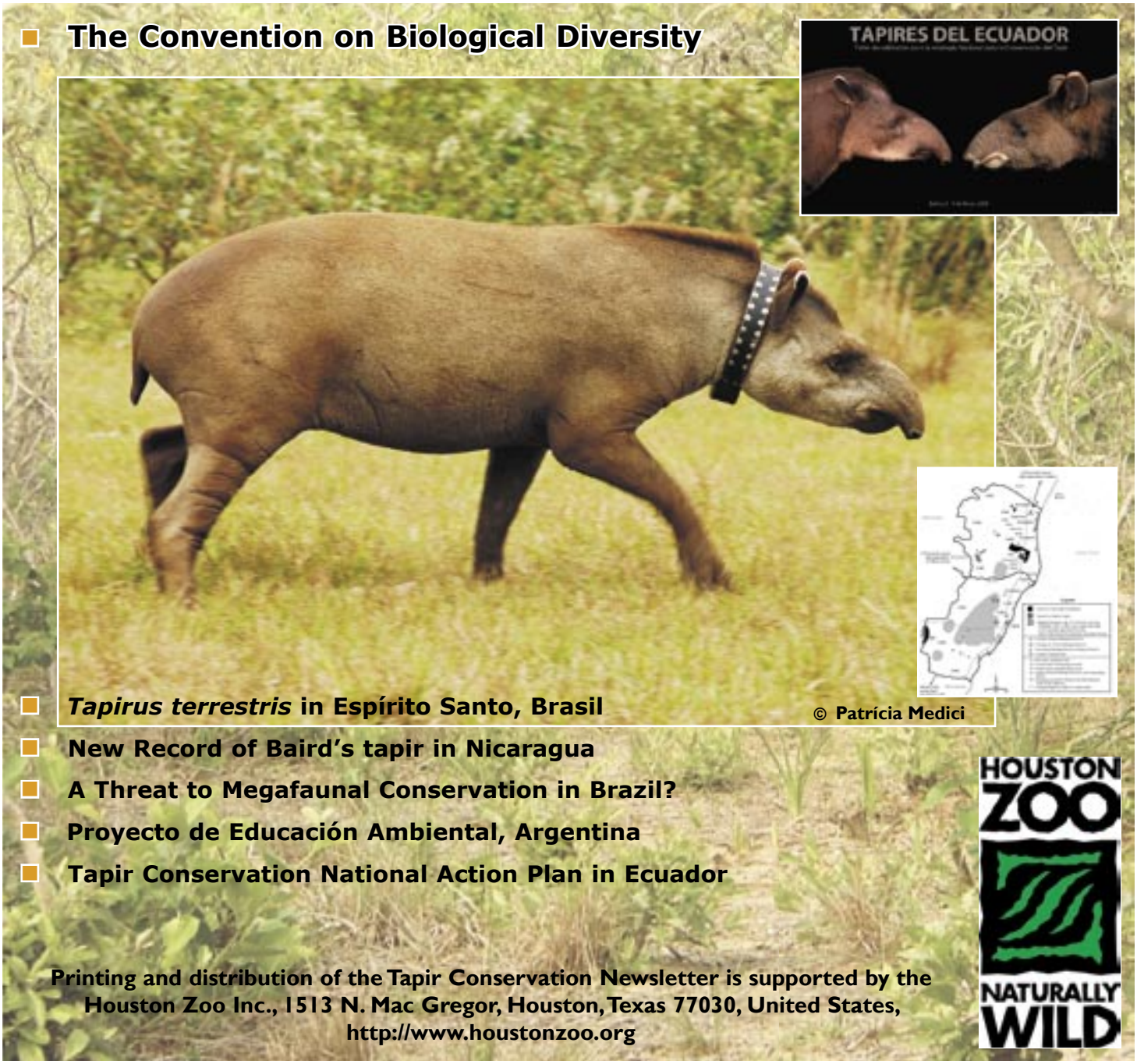
ISSN 1813-2286
Volume 19/1 ■ No. 26
June 2010

TAPIR SPECIALIST GROUP

Tapir Conservation

The Newsletter of the IUCN/SSC Tapir Specialist Group

www.tapirs.org



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

HOUSTON ZOO
NATURALLY WILD

CONTENTS

Volume 19/1 ■ No. 26 ■ June 2010

TAPIR CONSERVATION

Abbreviation **Tapir Cons.**

ISSN **1813-2286**

Website **www.tapirs.org**

Contributions Editor **Carl Traeholt (Denmark/Malaysia)**
E-mail: ctraeholt@pd.jaring.my

Layout & Distribution Editors **Stefan Seitz (Germany)**
E-mail: tapirseitz@web.de

Kelly J. Russo (United States)
E-mail: krusso@houstonzoo.org

Production & Distribution This issue is kindly sponsored by Houston Zoo Inc., Kelly Russo, 1513 North Mac Gregor, Houston, Texas 77030, USA.

Thinking about 2010, I realized that I have been the Chair of the Tapir Specialist Group for 10 years! Yes, 10 years... I have to say that it has been a most exciting, productive decade and we have managed to accomplish so much as a group. The TSG is an impressive group of people and I am very proud of it. Reflecting on our accomplishments since 2000, I thought of a few highlights I would like to mention here...

We made major re-structuring of the Tapir Specialist Group through the creation of several committees, taskforces, working groups and positions *i.e.* species coordinators, country coordinators. This was done in order to better address the challenges and issues of tapir conservation across different continents, locations and circumstances. The decentralization and improvement in communications made us much more efficient. We organized and hosted four international tapir symposia (Costa Rica, 2001; Panama, 2004; Argentina, 2006; Mexico, 2008) that brought the international tapir conservation community together on a regular basis. The First International Tapir Symposium held in San José, Costa Rica, in 2001, was a major boost for tapir conservation and since then the Tapir Specialist Group has been evolving and improving as a group. We developed Strategic Plans for the TSG during each tapir symposium, establishing priority goals and actions to be implemented in-between conferences in order to make the group more effective and pro-active. We updated the 1997 Tapir Action Plan by carrying out Population and Habitat Viability Assessment (PHVA) Workshops for each tapir species (Malayan tapir, Malaysia, 2003; Mountain tapir, Colombia, 2004; Baird's tapir, Belize, 2005; Lowland tapir, Brazil, 2007) and developed new Tapir Action Plans including priority goals and action steps for each species. Most importantly, we put together an Action Plan Implementation Taskforce, which has been working towards ensuring that these plans are going to be fully implemented. We have continuously supported our TSG Country Coordinators in the process of developing National Action Plans for Tapir Conservation in several tapir range countries, a process that is still ongoing. We have considerably improved our tapir Red List Assessments. We established the TSG Conservation Fund (TSGCF), a vehicle to raise funds and offer support through small grants to tapir field projects. We established strong, long-term partnerships with the AZA and EAZA Tapir Taxon Advisory Groups, an alliance that provided us with a perfect platform for successfully linking *in-situ* and *ex-situ* tapir conservation, as well as for raising funds for the TSG and for tapir conservation in general. We built a fantastic website, which constitutes the group's main communications and awareness tool for the tapir conservation cause. We developed promotional and educational brochures and flyers to be used by tapir conservationists worldwide. We also managed to put tapirs in the media on a regular basis! We built a virtual tapir library as part of our website, including PDF copies of e-v-e-r-y-t-h-i-n-g that has been published on tapirs so far... which is pretty incredible! We worked really hard to make this newsletter what it is today, a well structured, peer-reviewed resource for publications on tapirs. Speaking of publications, we developed and published a number of documents relevant to tapir conservation including the "Tapir Field Veterinary Manual", "Manual for the Collection and Storage of Tapir Samples for Genetic Studies", "Guidelines for Tapir Re-Introductions and Translocations" among many others. All brochures and scientific documents published by the Tapir Specialist Group have been translated into all relevant languages so that they can be used by tapir conservationists in all tapir range countries. I could go on and on and list many other accomplishments of the Tapir Specialist Group over the last 10 years... All in all, I strongly believe that as a consequence of all these activities, thanks to the commitment and passion of our incredible membership, tapir conservation now features very prominently on the international conservation radar!!!

Nevertheless, I personally look forward for 10, 20 more years of work with the Tapir Specialist Group, because we still have so much to do! In fact, 2010, is going to be an extremely busy year for the TSG. One of our most important activities for 2010 will be the organization of the upcoming Fifth International Tapir Symposium to be held in Kuala Lumpur, Malaysia, in March 2011. We will be organizing and holding

the symposium in partnership with the Malaysian Department of Wildlife and National Parks (DWNP). We are currently putting together a planning committee to take care of the logistics of the event, a scientific committee to work on the symposium agenda and selection of papers and posters, and a fundraising committee to raise the necessary funds for the conference. Our local organizers are actively seeking an appropriate venue for the symposium. We should be able to open for registrations and to send out a call for abstracts very soon. This is going to be a very exciting conference and I hope **all of you will be able to attend**! We will keep you posted about the developments on this front.

Besides the tapir symposium, in 2010 we will be focusing on developing the activities of our Action Plan Implementation Taskforce, and we will put a lot of energy into developing National Action Plans for Tapir Conservation. We already have plans for Argentina, Colombia, Ecuador, and Mexico. The action plans for Guatemala and Indonesia are well on their way.

We will continue to have lots more to report in the upcoming issues of Tapir Conservation. I hope you will enjoy this issue!

All the best for a wonderful 2010,

Patrícia Medici
M.Sc. in Wildlife Ecology, Conservation and Management
Ph.D. Candidate, Durrell Institute of Conservation and Ecology (DICE), University of Kent, UK
Lowland Tapir Conservation Initiative, IPÊ - Instituto de Pesquisas Ecológicas, Brazil
Chair, IUCN/SSC Tapir Specialist Group (TSG)
Facilitator, IUCN/SSC Conservation Breeding Specialist Group (CBSG) - Brasil Network
Rua Taiobá, 672, Bairro Cidade Jardim, CEP: 79040-640, Campo Grande, Mato Grosso do Sul, BRAZIL
Phone & Fax: +55-67-3341-8732 /
Cell Phone: +55-67-9965-6960
E-mail: epmedici@uol.com.br; medici@ipe.org.br

SPOTLIGHT

The Tapir Research Spotlight

Anders Gonçalves da Silva, Mathias Tobler

Welcome to our second research spotlight. As reminder, the objective of the spotlight is to feature a selection of the scientific literature relevant to tapirs, tapir conservation, or tapir scientific inquiry. For this edition, we picked three articles, although two are connected and will be covered under one headline. The first is about a topic dreaded by civil liberty activists and loved by right wing fanatics, surveillance. The other two bring us to the forefront of conservation genetics, or what might be called conservation genomics... Tapiromics, in our case! I hope you enjoy it!

Big Brother is Watching You!

Tobler. 2009. New GPS technology improves fix success for larger mammal collars in dense tropical forest. *Journal of Tropical Ecology* 25: 217-221.

In 1949, George Orwell published his famous book, *1984*, which described a totalitarian society constantly under surveillance by their leader, Big Brother. Although spooky and creepy, Orwell wasn't too far from the truth. Open the newspaper in 2009 and you are greeted with news of the Swiss government suing Google because their Google Map Street View application impinges on Swiss citizen privacy; or that our cellphones and Facebook accounts are being tracked to figure out our movement patterns and habitats for reasons as diabolical as tailoring product adds. News pieces of this flavor always make me think about the famous words: *Big brother is watching*! And leads to the obvious conclusion that surveillance is pervasive in our society. Whether good or bad is not the purpose of this piece to discuss, however it lends itself to much debate between civil rights activists and people of the right wing persuasion. The irony is that, in spite of our left leaning tendencies as conservationists, in a broader discussion about surveillance, we would definitely have to side with the right-wingers on this one. Surveillance (although, we conservationists prefer the world *monitoring*) is essential to conservation biology, and nothing will get our group more excited than a dinner discussion about how to best get inside information on the movement, preferences, friendships, feuds, etc. of the individuals of our favorite tapir population. In fact, it is probably safe to say that at the top of our Christmas list is having "critter cams" (collars fitted with video cameras that transmit live feed), like the ones deployed by the National Geographic crew on bears in Alaska, fitted to all individuals in our

favorite tapir population and have the feed transmitted directly to our field camp site's living room's flat screen TV. Now that would be surveillance at its best! The reason for this is simple: Knowing the preferred hangouts, routes, mates, and seasonal and yearly variation in hangouts, routes and mates is probably one of the most important data needed to establish conservation priorities. However, we don't all have "critter cams", and for years biologists have been relying on tracks, scats, and other indirect methods to observe their favorite fauna in the wild. In the past couple of decades, radio telemetry has become popular (and affordable). In this case, you capture a few individuals; fit them with collars equipped with radio transmitters. You then release them, and follow them around with an antenna. With a handful of locations and a little geometry, you can have pretty precise location estimates. However, dense forest and mountainous areas usually are not adequate for this type of surveillance. Mainly because the trees and rocks get in the way of the radio signal, either blocking it all together or bouncing it in random directions, and then you can't really get a good fix on your animals. In addition, the dense tropical forests are not really conducive for moving freely about with an antenna following your animal wherever it may go, as is the African savanna. Here enters the work done by Mathias Tobler, who tested collars fitted with the latest GPS technology, or Global Positioning System. The general idea is that you can fit a tapir with a collar containing a GPS unit and an onboard memory. You program it to attempt location fixes at periodic intervals and store the data to the onboard memory for a specified amount of time (say 12 months), thus releasing the biologist from the frustrating task of negotiating the jungle while carrying a huge antenna and allowing him or her time for more pleasant activities such as reading the *Tapir Newsletter*. He tested a variety of scenarios covering different types of habitat in the Amazon jungle, one of the toughest places for traditional radio telemetry. What he found is that the GPS system will fail to get a precise geographic coordinate while sitting on a moving tapir's neck about 50% of the time, however the system is still so energy efficient, that it can collect data at a rate of six points an hour. So, even if only half of the points are useful, you still have three points an hour for 12 months. This is unprecedented in tropical dense jungles and promises to revolutionize wildlife monitoring of large elusive fauna. Given that we previously had little luck following tapirs in the jungle, I would say that Orwell would be proud of such high-resolution surveillance.

Anders Gonçalves da Silva

The Age of Tapiromics …

Genome 10K Community Scientists. 2009. Genome 10K: A proposal to obtain whole-genome sequence for 10,000 vertebrate species. *Journal of Heredity* 100(6): 659-674.

Wade et al. 2009. Genome sequence, comparative analysis, and population genetics of the domestic horse. *Science* 326: 865-867.

As long as we are talking about privacy issues, genomes are very topical. Medical insurance companies are itching to get access to people's genomes (the entire library of your genetic material). If you have ever watched *Gattaca* it becomes painfully clear why, if you haven't, the idea is that your whole medical life is thought to be able to be mapped from examining your genetic code. What are the chances of getting a particular cancer or a certain degenerative disease or becoming addicted to morphine are some of the questions that might be answered by comparing your genome with other people's genomes. This future is likely not too far away! The *Human Genome Project* took about four years at a cost of about US$300 million dollars (or about US$0.1/base). Today, it would take about a week at about US$15 thousand dollars (or about US$0.000005/base). Next year new technologies promise to do it within 4 minutes and less than US$ 1,000 dollars. These technical revolutions have led a group of scientists headed by David Haussler, Stephen J. O'Brien and Oliver Ryder, called the Genome 10K Community of Scientists (G10KCOS) to announce a proposal for sequencing the genomes of 10,000 vertebrates, which is approximately one genome/vertebrate genus. Similarly to comparing across individuals, comparing genomes across species we can begin to understand similarities and differences that might be associated with specific behaviors, adaptations, and traits. For instance, do mountain dwelling mammals have similar adaptations for low oxygen? Or, are there similar genetic adaptations to disease? Or, what is the diversity of responses to environmental stress? Thus, as outlined by the authors, examining 10K vertebrate genomes holds the promise of "*address an increasingly urgent need to predict species' responses to climate change, pollution, emerging diseases, and invasive competitors*". What does any of this mean to tapirs? Well, Malay tapirs are at the top of the list as an important species for the initiative. How does the horse genome relate to this? As a close relative, information found about the horse genome will be relevant to tapirs, and are a head start to map out the function of different genes in the tapir genome. An interesting find so far (curious, in fact) is that horses are closer to humans (have higher sequencer similarity) than to cows. Given the similarity between tapir and horse genomes (see

previous spotlight), the conclusion is that tapirs and human are likely to share more bases than tapirs and cows. Now, that, if nothing else, is a very good reason for conserving tapirs. Notwithstanding, the future prospects of tapir conservation genetics are quite exciting. The possibilities of identifying important genetic resources for climate change adaptation, and surveying and monitoring this variability in captive and natural populations would be a dream for mountain tapir and Baird's tapir conservation. Figuring out horse immunological genetic resources and surveying them in areas of horse/lowland tapir interactions would supply fine resolution on the epidemiological interactions between stock and wildlife. In addition, these genomic resources will open the door for the development of high-resolution single nucleotide markers (SNPs) that can be used to quickly survey genomic variation to infer current and past demography and identify signatures of natural selection in all four tapir species. In short, the times are exciting and the possibilities are extraordinary! Never before have been able to prod so deeply into the genomes of the tapir and other mammals. I don't know about you, but much like the medical insurance companies, I am itching to get my hands on that data.

Anders Gonçalves da Silva

CONSERVATION

The Convention on Biological Diversity (CBD) – Conservation, Sustainable Use and Equitable Sharing of the Benefits

Dena Cator

Background

In 2005, the Millennium Ecosystem Assessment concluded that 60% of ecosystem services worldwide had become degraded, mostly in the past 50 years and primarily because of detrimental land and ocean-use practices. Fish stocks are increasingly being exploited and managed above their carrying capacities, leading to population collapses. At the species level, The IUCN Red List of Threatened Species™ tells us that species threatened by extinction worldwide include 22% of the world's mammals, nearly one third of amphibians, one in eight birds, 27% of reef building corals and 28% of conifers. Species extinction rates are 1,000 times higher than those in pre-human times and are increasing.

In response to these enormous pressures, the United Nations Environment Program (UNEP) started working in the late 1980s / early 1990s to develop an international treaty with the primary mandate of addressing the issue of biodiversity loss worldwide. The result was the Convention on Biological Diversity (CBD), its intent being to: enable the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits from using genetic resources. The CBD Convention was presented for signing in June 1992 at the seminal UN Conference on Environment and Development (the Rio "Earth Summit"). It entered into force in December 1993 and possesses a number of thematic programmes of work as well as cross cutting issues (for more information on these see: http://www.cbd.int/programmes/).

In 2002, 10 years after the CBD was put forward for signing, its Parties adopted a Strategic Plan which included, as its mission, the target of achieving by 2010 "a significant reduction of the current rate of biodiversity loss at global, regional and national levels as a contribution to poverty alleviation and to the benefit of all life on Earth" – the 2010 biodiversity target (also listed by CBD as a cross-cutting issue). The 2010 biodiversity target has been subsequently endorsed by the World Summit on Sustainable Development and the United Nations General Assembly (UNGA) as well as being incorporated into the UN's Millennium Development Goals (MDGs), eight international development goals that all United Nations member states and a number of international organizations have agreed to achieve by the year 2015. In 2006, the UN General Assembly declared 2010 as the International Year of Biodiversity (see: http://www.un.org/ga/ and http://www.un.org/millenniumgoals/).

The CBD Strategic Plan and 2010 Biodiversity Target

The original CBD Strategic Plan developed in 2002 (which has the 2010 Biodiversity Target as its Mission) had four main goals and accompanying targets as follows (see http://www.cbd.int/sp/ for the full document):

Goal 1: The Convention is fulfilling its leadership role in international biodiversity issues.
Targets include: The Convention setting the global biodiversity agenda; The Convention promoting cooperation between all relevant international instruments and processes to enhance policy coherence; Parties collaborating at the regional and subregional levels to implement the Convention.

Goal 2: Parties have improved financial, human, scientific, technical, and technological capacity to implement the Convention.
Targets include: All Parties having adequate capacity for implementation of priority actions in national biodiversity strategy and action plans.

Goal 3: National biodiversity strategies and action plans and the integration of biodiversity concerns into relevant sectors serve as an effective framework for the implementation of the objectives of the Convention.
Targets include: Every Party having effective national strategies, plans and programmes in place to provide a national framework for implementing the three objectives of the Convention and to set clear national priorities.

Goal 4: There is a better understanding of the importance of biodiversity and of the Convention, and this has led to broader engagement across society in implementation.
Targets include: All Parties implementing a communication, education, and public awareness strategy and promoting public participation in support of the Convention, including involving indigenous and local communities as well as the private sector in this work.

The CBD Strategic Plan does not directly link to the thematic programmes of work and the cross-cutting issues of the CBD listed here (http://www.cbd.int/programmes/) but the plan is an overarching guide for the work of the CBD as a whole.

To assess progress on achieving the goals of the pre-2010 Strategic Plan, a framework of seven focal areas along with indicators of biodiversity status and trends, goals, and targets was adopted. The 2010 Biodiversity Indicators Partnership (BIP) was also created, which coordinates the delivery and communication of indicators measuring progress towards the 2010 Biodiversity Target. For more information on BIP, see: http://www.twentyten.net/.

Progress on Achieving the 2010 Biodiversity Target

Almost 20 years after CBD was created, 192 countries have become Parties to the Convention, signing on with the commitment of delivering its objectives. There have been nine "Conference of the Parties" meetings where the evolving content and progress of the work to be undertaken has been decided. Since the development of the CBD Strategic Plan in 2002, the Parties to CBD have been meeting regularly and taking steps to translate the general provisions of the Convention into practical action. This process has initiated national action plans in 170 countries to date (see: http://www.cbd.int/nbsap/), raised awareness about biodiversity and led to the adoption of the Cartagena Protocol on Biosafety, which provides an international regulatory framework for the safe transfer, handling and use of any living modified organisms resulting from modern biotechnology.

However, much remains to be accomplished and it is generally agreed that we have missed the CBD's target of reducing the rate of biodiversity loss by 2010. According to the Biodiversity Synthesis of the Millennium Ecosystem Assessment, "unprecedented additional efforts would be needed to achieve, by 2010, a significant reduction in the rate of biodiversity loss at all levels" (see: http://www.cbd.int/2010-target/achieving.shtml). A primary reason for this is that most of the direct drivers of biodiversity loss are projected to either remain constant or to increase in the near future. For example, the overall rate of habitat loss, which is the main driver of species loss in terrestrial ecosystems, is now slowing in temperate areas but is projected to continue to increase in tropical areas. The second edition of Global Biodiversity Outlook, a CITES Secretariat and UNEP-WCMC led publication that provides an overview of progress made on implementing the CBD and the 2010 Biodiversity Target, suggested in 2006 that policies developed under the Convention were sufficient to meet the 2010 Biodiversity Target but must be widely applied, in all relevant sectors, if conservation and sustainable use are to be achieved.

2010 Activities

This year, 2010, is critically important as it is the UN-designated International Year of Biodiversity, the year when the CBD's 2010 biodiversity target will be assessed and a number of meetings will take place that will decide the future direction of the CBD Strategic Plan and post-2010 target.

Trondheim Conference – One of the first meetings that took place in 2010 was in Trondheim February 1-5, hosted by the Norwegian Ministry of the Environment in collaboration with the United Nations Environment Program (UNEP) and the Secretariat of the Convention on Biological Diversity (SCBD). The meeting allowed governments to discuss progress on and lessons learned from the 2010 Biodiversity Target as well as possible

ways forward for the developing post-2010 biodiversity targets. For more information, see: http://www.trondheimconference.org/content.ap?thisId=500039631.

SBSTTA – The next major meeting that will take place will be the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) meeting that will take place 10 – 21 May 2010 in Nairobi, Kenya. The purpose of the meeting will be for the CBD Parties and their scientific experts to discuss the agenda items and corresponding documents that outline an updated approach to meeting the CBD's various programmes of work and cross-cutting areas. For more information on the agenda items being discussed at SBSTTA and the documents, see: http://www.cbd.int/doc/?meeting=SBSTTA-14. The task at SBSTTA will be for the country delegations to review, possibly edit and approve or reject the recommendations for each agenda item, which provide a way forward for the various programmes of work for the CBD. Various elements of the new CBD Strategic Plan will be discussed at SBSTTA such as the goals and targets. The third and most current version of the Global Biodiversity Outlook publication, which assesses progress on implementation of the CBD and has involved the participation of SSC members, will be released in May and discussed at SBSTTA.

WGRI – The Working Group on the Review of Implementation (WGRI) will meet just after SBSTTA. The purpose of WGRI will be for governments to take the revised goals and targets of the new CBD Strategic Plan that are decided on at SBSTTA and decide on concrete approaches for their implementation. For more information on the agenda items being discussed at WGRI and the associated documents, see: http://www.cbd.int/doc/?meeting=WGRI-03.

CBD CoP10 – The 10th Conference of the Parties meeting (CBD CoP10) will take place from 18 – 29 October 2010 in Nagoya, Japan. This will be the culmination of all the other CBD meetings in 2010 and will be the venue where Parties to CBD will finalize and sign off on the documents and associated recommendations related to the various programs of work for CBD, including the new CBD Strategic Plan (and post-2010 Biodiversity Target). For more information on the agenda items being discussed at CoP10 and the documents, see: http://www.cbd.int/doc/?meeting=COP-10. A few weeks before CBD CoP10, a special high-level one day meeting of the United Nations General Assembly (UNGA), with the participation of heads of State and Government, will address biodiversity for the first time, focusing on the post-2010 targets and the role of biodiversity and ecosystem services in addressing the challenges of climate change, poverty reduction and economic development.

The new CBD Strategic Plan (post-2010 Biodiversity target)

The CBD has been working to develop a new CBD Strategic Plan (a post-2010 Biodiversity Target) (see: http://www.cbd.int/doc/meetings/wgri/wgri-03/official/wgri-03-03-en.pdf for the document to be discussed at WGRI and http://www.cbd.int/doc/meetings/sbstta/sbstta-14/official/sbstta-14-10-en.pdf for the document to be discussed at SBSTTA). The new Strategic Plan has five revised strategic goals with a variety of new accompanying targets to be met by the year 2020, as follows:

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society.
Targets: By 2020, everyone is aware of the value of biodiversity and the steps they can take to protect it; the values of biodiversity are integrated by all countries in their national accounts, national and local strategies and planning processes, and by business, applying the Ecosystem Approach; subsidies harmful to biodiversity are eliminated, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied; Governments and stakeholders at all levels have formulated, and have begun to implement, sustainability plans to keep the use of resources within ecological limits.

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use.
Targets: By 2020, the loss and degradation of forests and other natural habitats is halved; overfishing and destructive fishing practices are eliminated; all areas under agriculture, aquaculture and forestry are managed sustainably; pollution from excess nutrients and other sources has been brought below critical ecosystem loads; pathways for the introduction and establishment of invasive alien species have been controlled and established alien invasive species are identified, prioritised and controlled or eradicated; manage the multiple pressures on coral reefs and other vulnerable ecosystems impacted by climate change and ocean acidification so as to maintain their integrity and functioning.

Strategic Goal C: Safeguard ecosystems, species and genetic diversity.
Targets: By 2020, at least 15% of land and sea areas, including the areas of particular importance for biodiversity, have been protected through representative networks of effectively managed protected areas and other means, integrated into the wider land- and seascape; the extinction of known threatened species has been prevented; the status of crop and livestock genetic diversity in agricultural ecosystems and of wild relatives has improved.

Strategic Goal D: Enhance the benefits from biodiversity and ecosystems.
Targets: By 2020, ecosystems that provide essential services, and contribute to local livelihoods, are safeguarded or are being restored, and adequate and equitable access to essential ecosystem services is guaranteed for all, especially for indigenous and local communities and the poor and vulnerable; the contribution of biodiversity to ecosystem resilience and to carbon storage and sequestration is enhanced, through conservation and restoration, including restoration of at least 15% of degraded forest landscapes, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Strategic Goal E: Enhance implementation through planning, knowledge management and capacity development, and the fair and equitable sharing of the benefits arising from the use of genetic resources.
Targets: By 2020, each Party has implemented an effective national biodiversity strategy, contributing to the achievement of the mission, goals and targets of the Strategic Plan; access to genetic resources is enhanced, and substantial benefits are shared, consistent with the international regime on access and benefit sharing; traditional knowledge, innovations and practices are protected and their contribution to the conservation and sustainable management of biodiversity is recognized and enhanced; knowledge and technologies relating to biodiversity, its value and functioning, its status and trends, and the consequences of its loss, are improved and widely shared; capacity (human resources and financing) for implementing the Convention has been increased tenfold.

The revised CBD strategic plan, its goals and targets, reflect two major shifts from the original 2010 biodiversity target. First, the CBD Secretariat has used a "driver, pressure, state, impact" response framework to outline the new goals and targets. This means that the targets in particular are much more specific and applied than pre-2010 – a result of the Parties and the Secretariat's concern that previous targets were not specifically addressing the drivers or pressures of biodiversity loss. Another shift was to make the new targets SMART – Specific, Measurable, Achievable, Realistic and Time-based.

Progress and success in achieving these Strategic Plan targets will be measured through indicators, specifically the Biodiversity Indicators Partnership (BIP), currently planned to be fully developed after the new post-2010 target has been agreed upon. In addition, milestones have been set for the work to be done in the Strategic Plan for earlier dates than 2020 – these will be discussed initially at SBSTTA and are reflected in Annex II of Document 10 on that agenda, along with the rationale for each target (see: http://www.cbd.int/doc/meetings/sbstta/sbstta-14/official/sbstta-14-10-en.pdf). The goals and targets plus their milestones will also be discussed more fully at the WGRI meeting.

IUCN's Role and Position on CBD

IUCN's Global Policy Unit has been developing several position papers for the upcoming SBSTTA and CoP meetings, their purpose being to inform and influence the views and opinions of Parties to the CBD. Wide consultation has been undertaken in this process. The position papers for SBSTTA are as follows:

1. General position paper – being finalized
2. Post-2010 biodiversity target framework as part of the new CBD Strategic Plan -– finalized, see: http://cmsdata.iucn.org/downloads/iucn_position_cbd_strategic_plan_and_post_2010_targets_11_march_2010.pdf).
3. Global Strategy on Plant Conservation (GSPC) – being finalized
4. Programme of Work on Protected Areas (PoWPA) – being finalized
5. Gender – being finalized

All of IUCN's position papers for the upcoming SBSTTA meeting will be finalized soon and made available on the same IUCN webpage as where IUCN's post-2010 biodiversity target position paper is currently posted (see: http://www.iucn.org/about/work/programmes/global_policy/). As they are being finalized, the position papers are being circulated among IUCN Secretariat staff and Commissions as well as IUCN Members, Partners, national CBD Focal Points (see: http://www.cbd.int/doc/lists/nfp-cbd.pdf) and the CBD Secretariat for their consideration. The briefing papers will be further developed for CBD CoP10 after SBSTTA (again through consulting with IUCN members, Commissions, the Secretariat, etc.) and several new briefing papers will also be developed as well.

IUCN's completed briefing paper for SBSTTA, which addresses the new CBD strategic plan (the post-2010 biodiversity target), was initiated in July 2009 with a consultation process that involved IUCN members, Commissions and the IUCN Secretariat and was finalized in March, 2010. To see the full paper, again see: http://cmsdata.iucn.org/downloads/iucn_position_cbd_strategic_plan_and_post_2010_targets_11_march_2010.pdf. The paper outlines IUCN's position on the structure and elements of a post-2010 biodiversity target framework and comments on the CBD's proposed new CBD Strategic Plan, its goals and targets. IUCN's recommendations include:

- Suggested wording for the 2050 Vision and 2020 Mission of the new CBD Strategic Plan.
- Recommendations for the focus, scope and content of the targets and indicators that will be used to assess implementation of the CBD Strategic Plan (the post-2010 Biodiversity Target).
- Suggestions regarding how the 2020 CBD Strategic Plan Mission can be achieved, including relating to: finances; engagement with the economic sector and the development community; cohesion between MEAs and other organizations; research, monitoring and assessment; engagement with the public sector and other stakeholders; communications; as well as other support mechanisms.
- Revised wording for the proposed Strategic Goals and Targets in the new CBD Strategic Plan.

IUCN further believes that it is essential that the elements of the new Strategic Plan for the CBD link to the Programmes of Work of the CBD and the decisions of the Conference of the Parties, including the Global Strategy for Plant Conservation (GSPC) and Programme of Work on Protected Areas (PoWPA). Each Programme of Work thus should clearly state which targets it contributes to in the Strategic Plan.

IUCN also outlines in its position paper that a 2050 Vision for the CBD Strategic Plan should aim not just to halt loss of biodiversity but also comprehensively restore the populations, habitats and ecological cycles that enable biodiversity goods and services to persist. IUCN further believes that the CBD Strategic Plan's Mission should be formulated in terms of a *level* of change rather than *rate* of change. In addition, the direct drivers of biodiversity loss (climate change, resource consumption, pollution, habitat fragmentation and destruction, unsustainable use of wild living resources, alien invasive species, emerging infectious diseases and bycatch) as well as indirect drivers (resource consumption, globalisation, trade, demographic drivers) need to be addressed specifically and explicitly through the targets of the new CBD Strategic Plan. Targets for restoration, as well as ecological and biological connectivity, should also be included.

Options for SSC Involvement

Members of the Species Survival Commission (SSC) can get involved in the work of the CBD a number of ways including:

1. Knowledge and information – Throughout the process of preparing for the various CBD meetings that will take place in 2010, IUCN has been making an effort to consult with its own internal Secretariat as well as IUCN Commissions, Members and Partners to obtain their feedback and views on how to approach the post-2010 CBD work. This will continue and additional position papers for the upcoming CBD CoP10 meeting will be circulated for review. Specialist Group members are encouraged to be aware of this review and consultation process and to contribute their knowledge and information to it where relevant – either to the IUCN policy documents or CBD meeting documents (e.g. for SBSTTA, CoP10, etc.).

2. Biodiversity Indicators Partnership (BIP) – Specialist Group input on the BIP initiative would be particularly appreciated, especially relating to design, baseline information, methodologies, etc. For more information, contact Jean-Christophe Vié at jcv@iucn.org.

3. Work with National governments – Specialist Group members can also communicate directly with their own governments on work and progress relating to the CBD through contacting their national CBD focal points (see: http://www.cbd.int/doc/lists/nfp-cbd.pdf for general focal points or http://www.cbd.int/doc/lists/nfp-cbd-powpa.pdf for PoWPA-specific focal points). These focal points are government representatives whose specific position is to be a link to CBD matters. Specialist Group members can ask questions of their national focal points, discuss key issues or communicate IUCN positions to them. Another approach for influencing national activities is to contribute to National Biodiversity Strategies and Action Plans (see: http://www.cbd.int/nbsap/) or the CBD National Reports which document progress on implementation of the CBD at the national level (see: http://www.cbd.int/reports/).

4. Side events – SSC members can also help contribute to side events at the SBSTTA and CBD CoP10 meetings (see: http://www.cbd.int/sbstta14/events/events.shtml?mtg=sbstta-14) for SBSTTA and http://www.cbd.int/cop10/side-events/?mtg=cop-10 for CoP10.

For more information on any aspect of this article, contact either Dena Cator at dena.cator@iucn.org or Sonia Pena-Moreno at sonia.pena-moreno@iucn.org.

Dena Cator
SSC Network Support Officer
Species Programme
IUCN (International Union for Conservation of Nature)
28 rue Mauverney, CH-1196 Gland, Switzerland
Phone: ++41 22 999 01 48; Fax ++41 22 999 00 15;
www.iucn.org/species

CONTRIBUTIONS

A New Record of Baird's Tapir *Tapirus bairdii* in Nicaragua and Potential Implications

Christopher A. Jordan[1], Kara J. Stevens[1], Gerald R. Urquhart[2], Daniel B. Kramer[3], Kirkman Roe[4]

[1] Michigan State University. Department of Fisheries and Wildlife. 13 Natural Resources - East Lansing, Michigan, 48824 USA. Corresponding Author, E-mail: jordan41@msu.edu
[2] Michigan State University. Lyman Briggs College and Department of Fisheries and Wildlife. 35 E. Holmes Hall, East Lansing, Michigan 48825 USA
[3] Michigan State University. James Madison College and Department of Fisheries and Wildlife. 370 N. Case Hall, East Lansing, Michigan 48825 USA
[4] Universidad de las Regiones Autónomas de la Costa Caribe Nicaragüense, Instituto de Recursos Naturales, Medio Ambientales y Desarollo Sostenible, Bluefields, Nicaragua

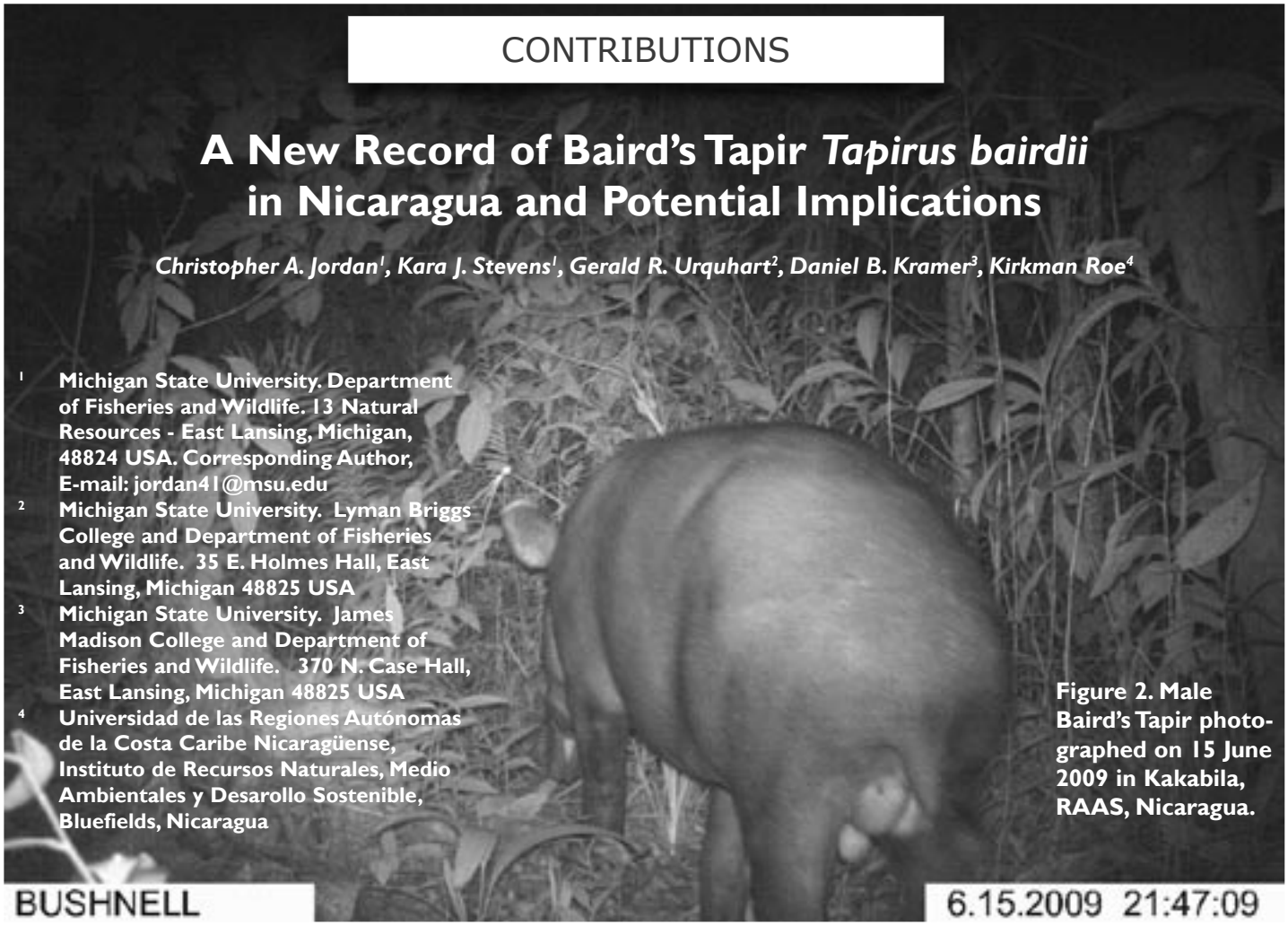


Figure 2. Male Baird's Tapir photographed on 15 June 2009 in Kakabila, RAAS, Nicaragua.

Abstract

The Baird's tapir *Tapirus bairdii*, acknowledged as the largest terrestrial mammal in Central and South America, is also one of the region's *rarer* mammals. The species is listed as endangered on the International Union for Conservation of Nature (IUCN) Red List, is an Appendix 1 Species on the Convention on the International Trade of Endangered Species (CITES), and less than 5,500 are estimated to be left in the wild. Further, it is expected that local overhunting and habitat fragmentation will cause continued declines in remaining populations of the Baird's tapir. Although Baird's tapirs were believed absent or extirpated from the Caribbean coastal forests of Nicaragua, we obtained evidence from camera traps and tracks along with local accounts that demonstrate its occurrence at multiple locations in the region. More rigorous tapir surveys will help elucidate if the tapir population of the Southern Atlantic Autonomous Region (RAAS) of Nicaragua is viable or is merely comprised of dispersing juveniles and not sustainable. Such data will have significant conservation implications for an area undergoing rapid land-use and land-cover changes due to expanding agriculture and increasing investments in infrastructure.

Keywords: Bairds tapir, camera trapping, local ecological knowledge, Miskito Coast, tracking,

Introduction

As the largest member of the megafauna of Neotropical rainforests, the Baird's tapir has become a flagship species for Latin American conservation. Organizations such as the Tapir Specialist Group and independent researchers have undertaken considerable effort to improve the general understanding of the Baird's tapir, but research in much of its range,

including Nicaragua and Honduras, remains limited (Fragoso, 1991; P. Medici pers. comm., M. Garcia pers. comm.). The IUCN Red List classifies it as endangered and estimates that less than 5,500 individuals remain in the wild (IUCN, 2009), and it has been in CITES Appendix 1 since 1975 (CITES, 2009). Furthermore, numerous sources cite the continued decline of the population due to increased habitat fragmentation and localized overhunting (IUCN, 2009; Tobler, 2002).

The geographic range of Baird's tapir extends from Oaxaca province in Mexico, throughout much of Central America, and into parts of the Andes in Colombia (IUCN, 2009) (Figure 1). However, the local distribution is less well known, particularly in those countries where research has been limited (M. Garcia, pers. Comm.; Medici et al. 2006). With reduced populations due to habitat loss, hunting, and other factors, it is increasingly important to understand where extant populations occur. Among the significant gaps in the known range of Baird's tapirs is the Caribbean Coast of Nicaragua, a key region in the Mesoamerican Biological Corridor, with vast areas of lowland rainforest and swamps.

Here, we present evidence of Baird's tapirs on the Caribbean coast of Nicaragua, where they were believed either extirpated or never present (IUCN, 2009). In Nicaragua, the Baird's tapir was previously only confirmed from the northern Atlantic coast near Honduras, the southern Atlantic coast bordering Costa Rica, the northwestern portion of the country, and the Matagalpa region (Brooks et al., 1997). From May to August 2009, we obtained camera trap, track, and anecdotal information from the communities of Kakabila, Wirin Key and Monkey Point, areas where tapirs were previously considered either extirpated or historically absent (Figure 1).

Study Area

Located in the fabled "Mosquito Coast" region of Nicaragua, the Southern Atlantic Autonomous Region (RAAS) is characterized by large expanses of lowland rainforests, swamps and mangroves. The climate in the RAAS is characterized by a marked wet season from May to December during which 2,000 to 4,000 mm of rain falls and large expanses of the terrestrial ecosystems are flooded (Christie et al., 2000). Mean annual temperature ranges from 25.6°C to 27.7°C (Christie et al., 2000). The coastal region of the RAAS under consideration is very ecologically diverse due to its widely varying soil composition, topography, and elevation The advance of agriculture and logging is threatening the ecosystems of the region, and continued hunting places pressure on wildlife populations.

Our research focused on four coastal communities where intact nearby forest is reported to harbor a high

Table 1. Pertinent data on the five study communities mentioned and the tapir data obtained in each.

Location	Area	Habitat	Nearby Community, Population and Distance	Local Tapir Reports	Camera Trap Effort 2009	Tapir Evidence
Kahka Creek	Rio Wawashang Nature Reserve	Lowland Rainforest	Pueblo Nuevo, pop. 4 km	Uncertain as to presence	182	None
Kakabila	Communally Managed Indigenous Lands	Lowland Rainforest, Swamp, Mangrove	Kakabila, pop. 300, 3 km	Considered present but rare	85	2009 Photograph from Camera Trap
Monkey Point	Cerro Silva Nature Reserve	Lowland Rainforest, Swamp, Mangrove	Monkey Point, pop. 120, 4 km	Considered present but rare	142	2009 Track Observations
Wirin Key	Cerro Silva Nature Reserve	Mangrove, Swamp, Lowland Rainforest	Wirin Key, pop. 30, 3 km	Considered present but rare	190	None
Caño Negro	Cerro Silva Nature Reserve	Swamp, Lowland Rainforest	La Union, pop. 40, 1 km	Previously considered present	none	1994 and 1996 Track Observations

diversity of terrestrial mammals (Table 1). Each of these locations faces myriad threats to protecting local ecosystems and ways of life and is the focus of a larger research project on combined social, economic and ecological changes on the coast.

Wirin Key and Monkey Point are coastal communities located in the over 266,000 ha Cerro Silva Reserve (Figure 1). Kahka Creek is located in the 231,500 ha Rio Wawashang Nature Reserve, near the agricultural community of Pueblo Nuevo. Kakabila is not in governmentally protected area but the land and nearby forests have been communally managed by the Miskito people for centuries (Jamieson, 1995).

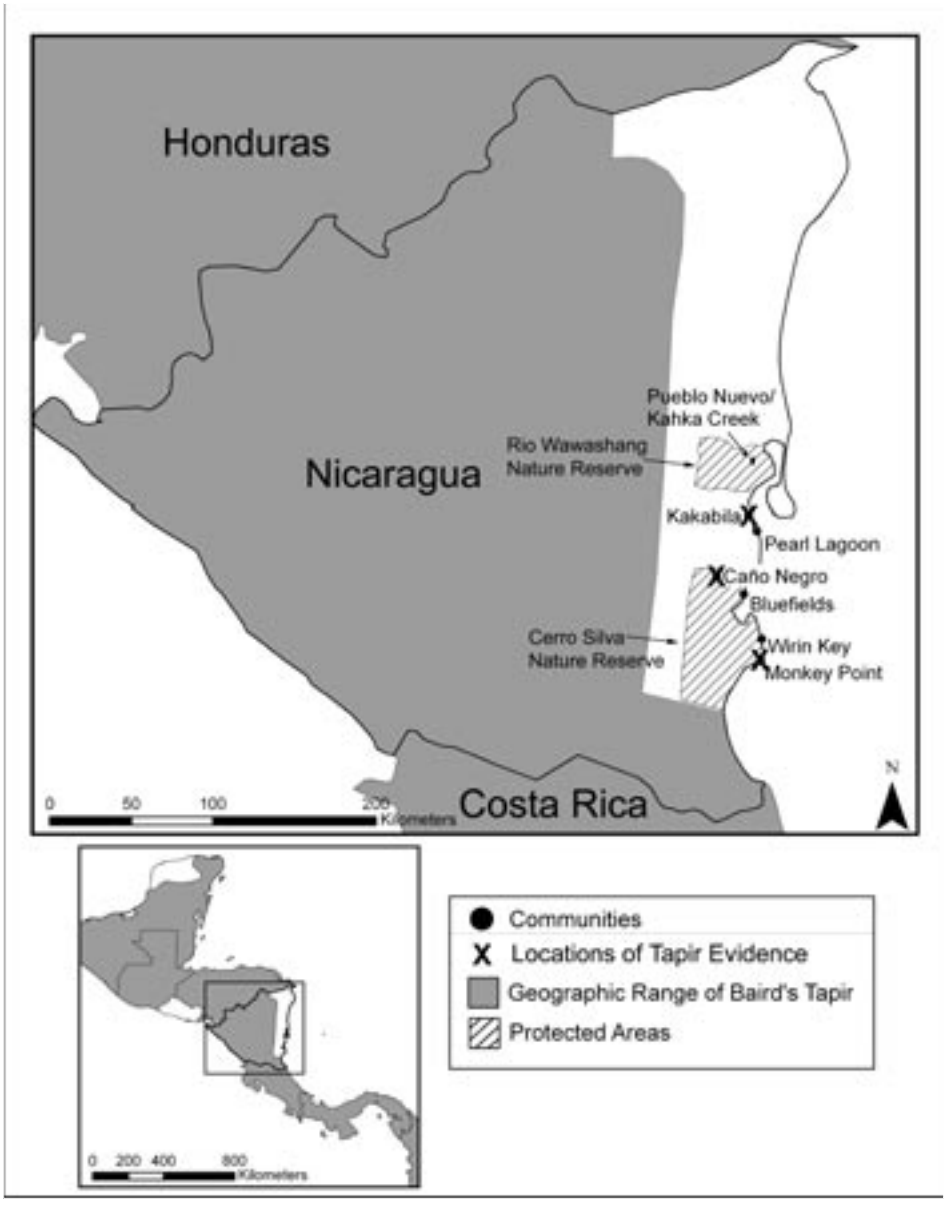


Figure 1. The locations of our study communities relative to the geographic range of the Baird's tapir according to the IUCN SSC Tapir Specialist Group (2009).

Methodology

We deployed 15 Bushnell Trophy Cams in relatively intact forest habitats surrounding four coastal communities to document the local, terrestrial biodiversity (Table 1). We placed cameras in May and June 2009, with the input and guidance of local ecological experts, in locations that we perceived would both take high quality photos and capture the highest species diversity. We retrieved data from the cameras in August 2009. Due to equipment failures with the cameras, we obtained a scattered sampling of mammals from each of these locations.

We also identified and recorded data on tracks and sign observed in time spent going to and from camera locations. Tracks were identified with the assistance of local knowledge and field guides. During previous research by one of the investigators in the coastal swamps of Nicaragua (Urquhart, 1997), track data were irregularly recorded, but some observations from that are also reported here.

Results

During the study period, we obtained data for 599 trap nights from the different locations (Table 1). The cameras that functioned properly recorded a high diversity of species of both the mammalian fauna and avifauna, including white-lipped peccary *Tayassu pecari* (multiple photos), puma *Felis concolor* (two photos), and jaguar *Panthera onca* (one photo).

One individual, male tapir was photographed in forests 3 km from the town of Kakabila on 15 June 2009 at 21:47 at the following coordinates: N 12°23.916, W 083°45.066 (Figure 2). In this forested area, three cameras functioned for a total of 85 total trap nights between 1 June and 17 August 2009, with some cameras failing after only a few days. The other two cameras did not record any photos of tapirs, but did record collared peccary

Tayassu tajacu (multiple photos), northern tamandua *Tamandua mexicana* (one photo), white-tailed deer *Odocoileus virginianus* (multiple photos), and other smaller mammals.

A tapir track was observed near Monkey Point on 11 June 2009 in close proximity to a selected camera trap location (N 11° 37.656' W 83° 41.435') in seasonal swamp forest less than 4km from the village. Two local guides acknowledged the presence of tapir in the area, though they reported observing tracks and direct sightings only very rarely. The cameras deployed at Monkey Point did not photograph tapirs in 142 trap nights, but because we experienced a high rate of equipment failure we are unable to be confident in this estimate of camera effort or the completeness of our mammalian survey. At Wirin Key (190 trap nights) and Kahka Creek (182 trap nights), we did not record any tapir photographs or observe any tracks, but experienced similar equipment failures at these locations as well.

We also accumulated anecdotal evidence of wildlife species through conversations with our local guides, who were very forthcoming with information about the local fauna. In Kakabila, for instance, as we were in the process of placing the camera that took the photo in Figure 2, our local Miskito guide correctly predicted that the location would lead to a tapir photograph. In Wirin Key, while no photos were taken, our guides explicitly informed us post-camera placement that our chosen locations were not far enough into the swamp to photograph a tapir. While this anecdotal evidence of tapir presence is not rigorous by any means, local peoples across the region, including our guide in Kakabila, have been shown to be keenly aware of tapir movement within and around their communities (Estrada, 2004; Flesher and Ley, 1996). This may be a function of the morphology of tapir feet, which is unique amongst the region's mammals and leaves readily identifiable tracks (Emmons, 1997).

Historically, tapir tracks were also observed on two occasions in large palm swamps near Caño Negro, about 15 km from the town of Bluefields in 1994 and 1996 (Urquhart, unpublished data). These are reported here as further evidence of tapir presence on the Caribbean coast.

Discussion and Conclusion

Our camera trap photos from Kakabila constitute a definite record for the Baird tapir in Nicaragua in an area where the species was not expected to occur. Track observations from Monkey Point (2009) and Caño Negro (1994, 1996) provide support for the presence of a population of Baird's tapirs on the Caribbean coast of Nicaragua. It is unlikely that a single individual is responsible for both the Kakabila photographs and the Monkey Point tracks, given the 85km distance and several geographical barriers (rivers, swamps, agriculture) between the two communities.

Despite these positive data, unsustainable harvest rates and expanding agriculture, similarly occurring in other regions of Latin America (See: Koster, 2006; Naranjo, 2009), constitute serious threats to tapirs in the RAAS and may eliminate or have already eliminated what was once a viable population. It is possible that the photographed specimen is an individual dispersing male or the remnant of a previously viable population.

Nonetheless more research is necessary to understand the actual abundance of Baird's tapirs in the region because many of the habitat elements of the RAAS match those found in other regions with tapir populations. One of the two habitat types used most frequently in Fragoso's (1991) study area had been selectively logged 16 years prior to his research. In Nicaragua, current conditions are likely similar to this preferred habitat type as Hurricane Joan created an abundance of early successional vegetation 21 years ago that has since grown into secondary forest with a mix of tree cover and understory browse. Fragoso (1991) also found that tapirs utilize floodplains at a higher rate than expected. The seasonally flooded forests and the abundance of *Raphia taedigera* palm swamps on the Caribbean coast (Urquhart, 1997) likely provide similar cover. Local guides also said that *Raphia* palm fruits are regularly consumed by tapirs. Flesher and Ley (1996), despite using an admittedly small data set from Honduras, applied a frontier model from the econometrics literature to infer that human settlements only exclude tapirs within a buffer zone of a mere 290 m. On top of this, the species does not appear to require an enormous home range; estimates include 94.9-125.0 ha (Foerster and Vaughan, 2002), 0.22-0.8 km^2 (Noss et al., 2003), and 500 ha (IUCN, 2009). Despite the recent increases in development, human settlements along in the RAAS are still at relatively low densities. Therefore, if the 290 m buffer rule and these estimates of tapir home ranges are veritable, the size and spatial distribution of the remaining tracts of suitable tapir habitat in this region of the RAAS are potentially large enough and the human populations sparse enough to support a population. If this is this case, our low number of tapir photos may simply be an artifact of camera placement and equipment failure.

Further research would improve the understanding of the species' local range in Nicaragua and could constitute a strong argument for more proactive conservation along the coast. Two of the large protected areas of the RAAS, the Cerro Silva and Rio Wawashan Nature Reserves, form an important link between two tapir strongholds that are key components of the

Mesoamerican Biological Corridor (MBC): the Corazon del Corredor Biologico Mesoamericano that sits on the Nicaragua-Honduras border to the north and the Corredor Biologico El Castillo-San Juan-La Selva that straddles the Costa Rica-Nicaragua border to the south. The documentation of a viable population spanning this entire range would provide support for local and regional conservation initiatives, strengthen the argument for establishing a contiguous MBC, and have important genetic implications for the survival of the endangered Baird's tapir.

Acknowledgements

This work was funded through the National Science Foundation's Coupled Natural and Human Systems program (CNH-0815966). Jenni Van Ravensway created the range map (Figure 1). Undergraduate students Justin Haveman and Christine Sarikas (MSU) and Melkin Blandón (URACCAN) assisted in the camera trapping. Our travel was greatly facilitated by the efforts of Jean Lyle Lepard and Kathleen Mills at the Center for Global Change and Earth Observations at Michigan State University. Diala Lopez at La Universidad de las Regiones Autónomas de la Costa Caribe Nicaragüense helped considerably in the organization of fieldwork. We are also very grateful to our many local guides.

References

Brooks, Daniel M.; Bodmer, Richard E.; Matola, Sharon (compilers). 1997. *Tapirs - Status Survey and Conservation Action Plan*. (English, Spanish, Portuguese.) IUCN/SSC Tapir Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. viii + 164 pp.

Christie, P., Bradford, D., Garth, R., González, B., Hostetler, M., Morales, O., Rigby, R., Simmons, B., Tinkam, E., Vega, G., Vemooy, R., and White N. 2000. Taking care of what we have: participatory natural resource management on the Caribbean coast of Nicaragua. Published jointly by the: Centre for Research and Documentation of the Atlantic Coast. Managua and the: International Development Research Centre. Ottawa. Pp. 85

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). 1999. Official website: http://www.cites.org/ [Accessed 20 September 2009]

Emmons, L.H and Feer, F. 1997. *Neotropical Rainforest Mammals: A Field Guide.* 2nd Edition. The University of Chicago Press, Chicago. pp. 396.

Estrada, N. 2004. Notes on the relative abundance and hunting of Baird's tapir in the Rus-Rus region of La Moskitia, Honduras: a proposed biological reserve. *Tapir Conservation*. 13(1):28-29.

Flesher, K. and Ley, E. 1996. A frontier model for landscape ecology: the tapir in Honduras. *Environmental and Ecological Statistics*. 3:119-125.

Foerster, C.R., and Vaughan, C. 2002. Home range, habitat use, and activity of Baird's tapir in Costa Rica. *Biotropica*. 34(3):423-437.

Fragoso, JM. 1991. The effect of selective logging on Baird's tapir. In: M.A. Mares and D.J. Schmidly (eds.) *Latin American Mammalogy: History, Biodiversity, and Conservation,* pp. 295-304. University of Oklahoma Press, Norman, OK, USA.

Holden, J., Yanuar, A., and Martyr, D.J. 2003. The Asian tapir in Kerinci Seblat National Park, Sumatra: evidence collected through photo trapping. *Oryx*. 37(1):34-40.

IUCN Red List. 2009. Official Home Page: http://www.iucnredlist.org/ [Accessed 19 September 2009]

Jamieson, M.A. 1995. Kinship and gender as political processes among the Miskitu of Eastern Nicaragua. London School of Economics and Political Science, London, UK. PhD dissertation

Karanth, K.U. 1995. Estimating tiger (*Panthera tigris*) populations from camera-trap data using capture-recapture models. *Biological Conservation*. 71:333-338.

Koster, J.M. 2006. Assessing the sustainability of Baird's tapir hunting in the Bosawas Reserve, Nicaragua. *Tapir Conservation.* 15(2):23-28.

Medici, E. P.; Carrillo, L.; Montenegro, O.L.; Miller, P.S.; Carbonell, F.; Chassot, O.; Cruz-Aldán, E.; García, M.; Estrada-Andino, N.; Shoemaker, A.H.; Mendoza, A. (Editors). 2006. Baird's Tapir Conservation Workshop: Final Report. IUCN/SSC Tapir Specialist Group (TSG) & IUCN/SSC Conservation Breeding Specialist Group (CBSG), Apple Valley, MN, United States.

Naranjo, E.J. Ecology and conservation of Baird's tapir in Mexico. 2009. *Tropical Conservation Science.* 2(2):140-158.

Norton, J.E. and M.V. Ashley. 2004. Genetic variability and population structure among wild Baird's tapirs. *Animal Conservation*. 7:211-220.

Noss, A.J, Cuéllar, R.L., Barrientos, J., Maffei, L., Cuéllar, E., Arispe, R., Rúmiz, D. and Rivero, K. 2003. A camera trapping and radio telemetry study of lowland tapir (Tapirus terrestris) in Bolivian dry forests. *Tapir Conservation.* 12(1):24-32.

O'Farrill, G., Calmé, S., and Gonzalez, A. 2006. A new record of a species dispersed by tapirs. *Tapir Conservation*. 15/1(19):32-35

Silver, S. 2004. Assessing jaguar abundance using remotely triggered cameras. Wildlife Conservation Society Jaguar Conservation Program. pp. 25.

Tapir Specialist Group. 2009. The World's Tapirs--The Baird's Tapir (Tapirus bairdii) http://www.tapirs.org/tapirs/bairds.html [Accessed: 28 September 2009]

Tobler, M. 2002. Habitat use and diet of Barid's tapirs (*Tapirus bairdii*) in a montane cloud forest of the cordillera de Talamanca, Costa Rica. *Biotropica.* 34(3): 468-474.

Townsend, J. 2002. Notes on Baird's tapir (*Tapirus* bairdii) from the southern region of Biosfera Tawahka-Asangni, Honduras. *Tapir Conservation.* 11(2):16-17.

Tapirus terrestris in Espírito Santo, Brasil

Kevin M. Flesher[1], Andressa Gatti[2]

[1] Centro de Estudos da Biodiversidade, Reserva Ecológica Michelin, Igrapiúna/Ituberá, Bahia, Brasil. E-mail: kevinmflesher@yahoo.com.br
[2] Programa de Pós-graduação em Biologia Animal, Universidade Federal do Espírito Santo. Av. Marechal Campos, 1468 – Maruípe, Vitória, Espírito Santo, Brasil. E-mail: gatti.andressa@gmail.com

Abstract

We investigated the conservation status of *Tapirus terrestris* in Espírito Santo by interviewing scientists and reserve managers working there and by visiting forests ≥ 1000 ha. Whereas tapirs inhabited the entire state at the beginning of the 20th century, their populations were reduced to three, or possibly four, isolated populations by the time of the study (2006). Widespread deforestation, escaped fires, and excessive hunting were the principal causes of the tapirs decline. Although hunting pressure has decreased in the past decades and does not appear to be an imminent threat to the extant populations, the populations in the two smaller reserves (Córrego Grande and Córrego do Veado) are vulnerable to escaped fires and the deleterious consequences of inbreeding depression. The larger population (Sooretama and Linhares reserves) has good prospects for long-term persistence. Each population is isolated from the others by inhospitable landscapes and due to the intensive use of these lands it is unlikely that it will be possible to create movement corridors. Conservationists are active in the state and as the reserve managers are supportive of conservation and research programs and there is suitable habitat for tapir re-introductions, the future for tapirs in the state is hopeful.

Key words: Espírito Santo, fire, isolation, persistence, *Tapirus terrestris*

Introduction

This study is part of the "Projeto Antas da Mata Atlântica" project of the IUCN/SSC Tapir Specialist Group with the aim of creating an updated biogeography of *Tapirus terrestris* in the Atlantic forest biome. Specific objectives include identifying all of the remaining populations and their geographical limits, assessing the conservation status of each population and of the landscapes/reserves they inhabit, identify the principal threats to these populations, to describe the types of habitats, both natural and anthropogenic, that these animals use, to identify areas of potential habitat where tapirs no longer exist, and to eventually synthesize this information in order to devise conservation action strategies to help guarantee the species persistence in the biome. In this first article we present our assessment of the Espírito Santo populations with subsequent reports to follow in the coming years.

Geography

Espírito Santo (46,077 km^2) is divided between two distinct geological regions: the tabuleiro sand plain lowlands north of the Rio Doce; and the highlands areas mostly to the south of the Rio Doce with granite outcrops and peaks exceeding 1,000 m (Figure 1). The entire state falls within the Atlantic forest biome, with evergreen broadleaf forests dominating, semi-deciduous forests along the southern border, restinga forests along the coast, and alpine vegetation on the rocky outcrops of the high peaks. The principal river is the Rio Doce, smaller rivers and streams are abundant, especially in the highlands, and the lakes near Linhares are some of the largest natural lakes in Brazil.

The state was the domain of several indigenous groups, but it was the Botocudos who controlled much of the hinterlands that prevented the Portuguese and later the Brazilians from occupying this area, and human settlements remained concentrated along the coast until the late 19th century. Only then did European immigrants begin to colonize the interior. German and Italian immigrants scaled the coastal palisade to farm the highland region, clearing much of the forest by the first decades of the 20th century, while the tabuleiro lowlands suffered large-scale clearing after the 1940s with most of the forests cleared by the early 1960s (Garay *et al.*, 2003).

Brown & Brown (1992) and Viana *et al.* (1996) calculate that only 10 % of the state remains under forest cover, but SOS Mata Atlântica/INPE (2002) estimate that approximately 30 % remains. While forest cover is increasing in the highland area as a result of agricultural intensification, farm abandonment, and an out-migration of the rural youth, the tabuleiro landscape is an intensively cultivated agricultural region and

forest is still being cleared and/or destroyed by fire. Today the landscapes of the highland areas are mosaics of cattle pastures, coffee and eucalyptus plantations, and yam, vegetable, fruit, and maize fields interspersed with closely spaced (mostly < 400 m) forest fragments. The vast majority of the forests consist of small (mostly < 10 ha) fragments growing on previously cleared land with tracts of mature forest widely scattered on the higher slopes and in some of the reserves. Eucalyptus plantations (especially east of BR-001), cattle pastures, and sugarcane fields dominate the tabuleiro landscapes, with lesser amounts of coffee and some large plantations of passion fruit, papaya, and rubber near Linhares. The lower course of the Rio Doce between Linhares and the ocean is flanked by old cabruca cacao groves and cattle pastures. Forest cover throughout the tabuleiros is much reduced and completely lacking in some areas or limited to degraded scraps of bush along the main rivers and streams. The majority of the fragments are small (1-4 ha, with fragments as large as 20 ha rare), widely spaced (500-1000+ m), and severely degraded.

Methods

We used a combination of field visits and interviews to determine the distribution and status of the lowland tapir *T. terrestris* in Espírito Santo. During these interviews with biologists, reserve officials, and people working in NGOs we asked specific questions about tapir population(s) (e.g. size, distribution, habitat use, extra-reserve use, etc.) in the regions they are familiar with. When possible we had the interviewees explain the distribution on maps. If there were no tapirs present, we asked about the history of tapir extinctions. We used these interviews as the principal basis for deciding which sites to visit.

Interviews with country people were semi-structured conversations during which we would introduce ourselves as biologists conducting a survey and ask what types of wildlife were found in the region. We would then ask what was the largest animal found in the region, and if they still did not mention tapirs, we would specifically seek information on tapirs asking if they knew when the species was extirpated. When they claimed that tapirs were present, we tested their knowledge of the species by asking questions about the natural history of tapirs and accepted or rejected the interview based on our assessment of their knowledge. We also asked if tapirs leave the forest and what types of agricultural lands they use. In some cases we were able to ask about hunting pressure and timber extraction.

In addition to the reserves with confirmed tapir populations, we visited sites that should have the potential to support tapir populations. We defined these sites as large (minimum ca. 1,000 ha) forests and landscapes with a high percentage of forest cover (ca. ≥ 25%) based on the supposition that these would most likely contain habitat for tapirs. We visited as many of these areas as possible and also the areas between the main forest blocks.

As we traveled through the state we kept detailed notes of the landscape, using towns, natural landscape features (e.g. hill ranges, rivers and roads), and GPS points as references, recording human land uses, forest cover, and the state of the forests.

Results

Areas Visited

In November 2006 we spent 15 days in Espírito Santo traveling throughout the central highlands, coastal region, and tabuleiro landscape and visiting 10 forest areas ≥ 1,000 ha. We did not visit the area south of Vitoria and Pedra Azul, but interviewed several scientists who work and/or live there. We interviewed 36 people including 7 scientists who between them had visited almost all of the forest reserves in the state, 20 park officials including the heads of the Córrego Grande, Córrego do Veado, Sooretama, Caparaó, Augusto Ruschi, Itaúnas, and Rio Preto reserves, and 11 other people who live near and work in forest reserves. Chiarello's (1999) and Lorenzutti and Padua Almeida's (2006) publications on the large mammals of the state were helpful references.

History of *Tapirus terrestris* in Espírito Santo

Tapirs inhabited all of Espírito Santo until the end of the 19th century and persisted in much of the state into the mid-20th century including the Vitoria area (the mountain by Serra) until the 1940s. The decline of the tapirs began with the invasion of the highland areas by German and Italian immigrants in the late 19th century (first families arrived in the Pedra Azul region in 1888 and in the Santa Teresa region in 1875).

Angelo Bellon, now 80 years old, explained that when his family arrived the region was completely forested and that the settlers first cleared forest to plant maize and beans and raise hogs for subsistence. Subsequently they cleared larger tracts of forest to create cattle pastures which became the principal economic activity for much of the following 100 years. They also selectively harvested trees from the forests throughout this period. In the 1970-80s charcoal producers moved throughout the highlands buying the rights to forest lots and burned many of the remaining forest fragments.

The immigrants throughout the highlands were avid hunters and killed everything, from small birds to tapirs, causing a precipitous decline in wildlife populations. Tapirs were especially valued for their hides as the leather was used to make whips and for hitching

the mule trains that were the principal means of transporting goods to the coast. The skin of highland tapirs (where temperatures drop to 0-3° C during the winter) was reportedly thicker than that of the lowland (tabuleiro) tapirs, and so more procured for these purposes.

Tapirs were mainly run with dogs and killed by hunters waiting at pools of water known as *poço das antas*. At one of these *poços* on Angelo Bellon's farm at the foot of Pedra Azul (it is a clear cool pool of water some 5-6 m wide and up to 2 m deep) hunters killed more than 20 tapirs. Hunters also killed tapirs in *forro* pit fall traps. These same methods were used throughout the highlands and tapirs were extirpated in the Pedra Azul region some 60-70 years ago (1940s), at which point they had been reduced to remnant populations inhabiting the forests of the highest slopes, having been extirpated from the farm areas early on (no reports of tapirs raiding crops during this time).

In the Alfredo Chaves highlands and to the north in the Santa Teresa and Colatina/Bananal regions hunters extirpated tapirs in the 1930/40s with some populations persisting into the early 1950s in some mountain strongholds. Recent reports of tapirs in the Caparaó National Park on the border with Minas Gerais still need to be verified. They disappeared in the coastal area around Vitoria by the mid-20th century. In the tabuleiro landscape to the north, the decline of tapirs followed the massive loss of forest cover in the decades following World War II cleared to make way for industrial plantations of eucalyptus, sugarcane, coffee and cattle pastures. By the 1960s most of these forests had been cleared and tapirs reduced to three isolated populations in four reserves.

Tapir Populations

Córrego Grande Biological Reserve: 80 % of this 1,540 ha reserve located on the border with Bahia (some 14km east of highway BR-101) was destroyed in a fire in 1987 and now consists of dense secondary forest with an upper canopy of 8-12+ m. Brejauba palms (*Astrocaryum aculeatissimum*) and bamboo are common in the understory. The 20 % of the reserve that did not burn supports a mature forest with spaced old trees reaching 20-30+ m and a fairly open understory. The terrain is flat and the soils are sandy as is typical of the tabuleiro region. The main stream is the Córrego Grande (that passes along the western and southern sides of the reserve) but it is no more than 2-3 m wide and 1m deep, and other streams are smaller with small ponds along their courses where they pass under the perimeter road. There is also a 20 ha lake with a dense growth of cattails to 1-2 m, surrounded by a dense thicket of thin vines, palms, bushes and young trees reaching 7-10 m. Eucalyptus monocultures dominate the surrounding landscape with forest cover reduced to the barest scraps of pioneer vegetation along the waterways.

None of the three people working in Córrego Grande Biological Reserve have seen a tapir, but have recorded tracks occasionally, especially along the perimeter road in the southern part of the reserve where tapirs appear to visit a jackfruit tree and along the lake where the tapirs wallow in small pools in the dense thickets of the lake edge. Tapirs are attracted to oiti (Chrysobalanaceae) trees during the fruiting season and the guards find tracks under these trees in the southern part of the reserve, but they do not appear to visit the mature forests along the western side of the reserve despite the abundance of oitis, and our guide (who has patrolled this forest for 5 years) has never seen tapir tracks in this area. He told us that sometimes they do not see tapir tracks for several months and he believes that the animals prefer the interior of the reserve where no one visits.

Hunters use the reserve, mostly visiting from neighboring properties, and sometimes arm rifle traps, but hunting pressure is not heavy and the last record of a tapir killed was in 2001. The largest threat to the tapirs appears to be wildfires and given that no contingency measures are in place to protect the reserve for these events, it is probable that fires will burn into the forest again in the future.

While tapirs could easily pass through the 5 strands of loose wire that fence in the reserve, there is no indication that they are doing so and this populations appears to have been isolated for several decades. The Rio Preto National Forest and properties neighboring it together preserve 5,000ha of forest only 8-10 km south of Córrego Grande and considering tapirs dispersal capacities it is conceivable that they would be able to recolonize these forests by following the Córrego Grande stream south to the Rio Itaúnas and then moving up that river for a kilometer, but there is no record of any individuals doing so.

We found a track of one large tapir by small shaded pools along the north side of the lake (S18° 14.815'; W39° 48.608') in an area of dense thicket of brejauba palms, *Heliconia*, *Piper* plants, and bamboo backed by a dense secondary forest reaching 7-12 m.

Córrego do Veado Biological Reserve: The reserve is several kilometers north of Pinheiros in northern Espírito Santo, some 20km west of BR-101, in an area that was largely deforested by the 1960s. 80 % of this 2,400 ha reserve burned in a fire started in a neighboring pasture in 1987 and now consists of a dense secondary forest similar to that of Córrego Grande. The remaining 20% of the reserve supports a mature forest with a diverse flora. The main stream is the Córrego do Veado that flows along the eastern side of the reserve and forms part of the upper Itaúnas River watershed. The surrounding landscape is largely deforested and only widely spaced scraps of degraded forest generally

<10 ha remain. Cattle pastures dominate the agricultural landscape with lesser amounts of land dedicated to sugarcane, manioc, coffee, papaya, and pumpkins.

The reserve personnel regularly see tapir tracks along the reserve road near the headquarters, especially in the dry season when the animals visit the two large streams there. Tapirs wander throughout the forest and there is a large and well-used tapir trail in the center of the reserve. There is also a curve on the perimeter road known as the *curva da anta* where the guards occasionally see a tapir resting.

Tapirs do occasionally leave the reserve to raid maize and manioc fields in neighboring farms, but there are no records of them traveling far beyond the forest edge and the population is considered isolated. The region sustains significant hunting pressure, but none of these appear to target tapirs and there are no recent reports of tapir killings. Consequently, hunting does not appear to pose an immediate threat to this population. Wildfires could pose a more imminent threat.

We found fresh and old tapir tracks, scats and a well used trail near the headquarters in the southeastern part of the forest in an area of dense secondary growth to 6-10 m.

Sooretama Biological Reserve and the Linhares Forest Reserve: At 24,000 ha Sooretama is the largest federal reserve in the state and is contiguous with the 22,000 ha Linhares Forest Reserve of the Vale do Rio Doce company together forming one of the largest blocks of Atlantic forest remaining in Brazil (46,000 ha). These reserves protect a large area of mature tabuleiro forest with old growth trees and a highly diverse fauna and flora. The forest profile in general is one of dense growth to 6-15 m with spaced larger trees to 20-30+ m and some giants passing 40 m. Thin lianas and vines are abundant in the dense lower stratum as are palms, especially brejauba and buri (*Polyandrococos caudensis*). The terrain is flat with steep shallow ravines along the waterways where the water cuts through the sandy soils. The largest river is the Barra Seca that runs along the northern boundary, but several other large streams/small rivers traverse the reserve from west to east. Waterways are choked with dense vegetation creating nearly impenetrable thickets. Cattle pastures, coffee farms, eucalyptus plantations, and sugarcane fields dominate the surrounding landscapes, with forest cover reduced to small widely spaced degraded fragments. We only visited the Sooretama reserve.

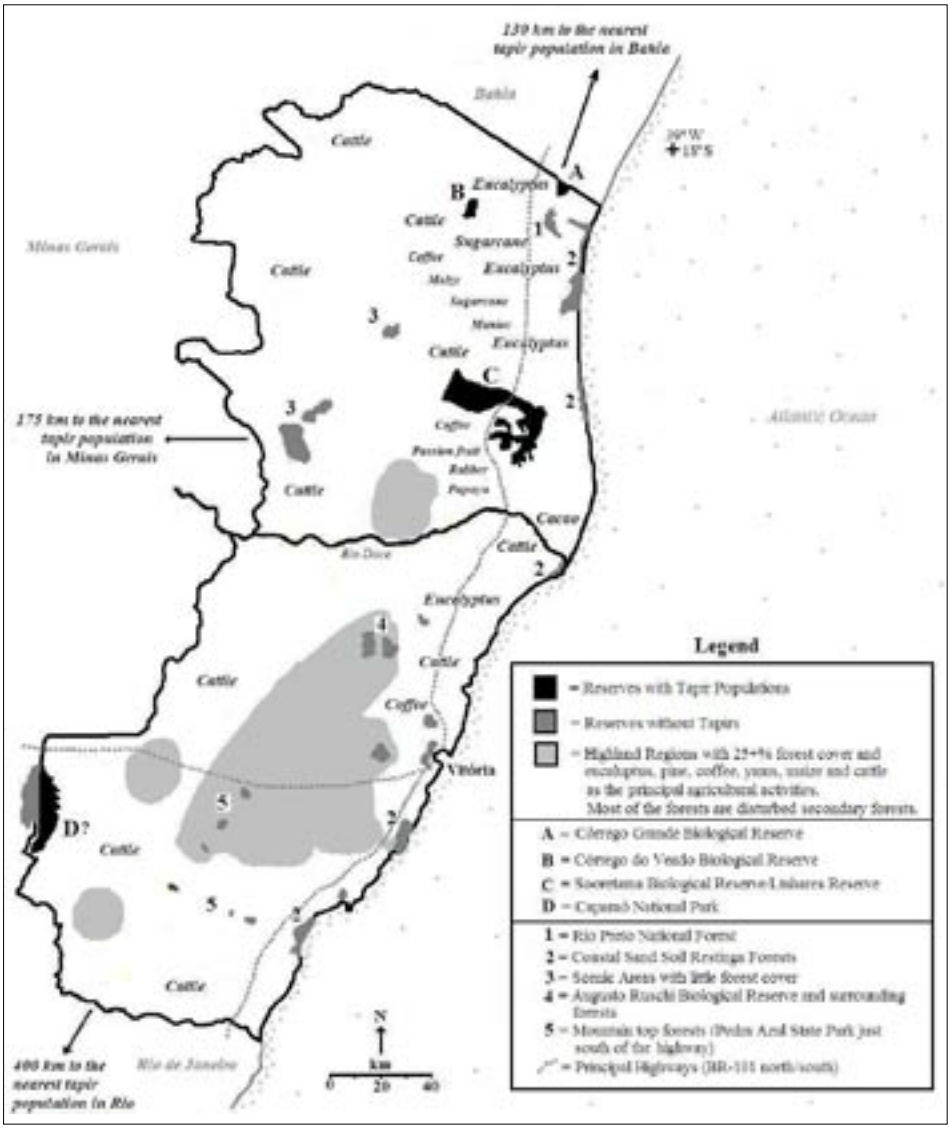


Figure 1. Tapirus terrestris populations in Espírito Santo.

Tapirs are rarely recorded around the headquarters on the central southern side of the Sooretama reserve, but elsewhere it seems fairly common and the five park officials interviewed had all seen tapirs in the past two years. The two areas in Sooretama where the guards most frequently find tapir signs are the Córrego Quirino and the Córrego d'Abóbora.

The Córrego Quirino is located in the center of the reserve (S 19° 00.679'; W 40° 06.019') in an area of mature forest with a profile of 6-10 m of dense growth with abundant brejauba palms and spaced taller trees to 20-30+m. It is a wide stream hidden in a dense thicket of

tall grasses, heliconias and scattered thin trees and palm clumps. A camera trap along the access road near the stream has photographed several tapirs there.

The Córrego d'Abobora lies in the northeastern sector of the park (S 18° 59.833'; W 40° 00.993'), feeding into the Rio Barra Seca 1km west of BR-101. In this section of its course it is a dense wetland of reeds some 50-70m wide flanked by a steep sided forested ravine. Where it joins the Barra Seca, the river opens into a large open channel in the middle of an extensive reed wetland up to 1 km wide with widely spaced hummocks supporting a few *Cecropia* and palm clumps. The forest in this area was burned in a large fire that entered the park from neighboring cattle pastures in 1987 and now consists of a dense secondary forest to 6-12+ m with few large mature forest trees. The security guard along the highway saw a tapir behind the guard post a few days before we arrived.

People occasionally see tapirs crossing the busy BR-101 highway that traverses the forest from north to south suggesting that the populations of the two reserves are still contiguous, and although the highway is a death trap for other wildlife, there were no tapir deaths registered during a year-long study (2005) of road kill. Given the large size of this forest block and the fact that tapirs use most or all of the forest area, the potential population could be large (100+ animals).

Tapirs rarely leave the forest, but recently an individual raided a passion fruit crop planted along the southern reserve edge, destroying 500 of the 1,200 plants before being captured and released in the Linhares reserve. Interviews with several people who live in Juncado 4.5 km south of the Sooretama reserve have never heard of tapirs anywhere beyond the forest edge. A man who works in the Lorenzutti museum used to see tapirs in properties (Fazendas Cupido & Refúgio) near the Lagoa Macuco in the Linhares reserve where tapirs are common and frequently found tracks along a dam trail above a wetland. In this area they sometimes raid pumpkin, cacao, and coconut crops (eating the young leaves of the latter) along the forest edge.

A tapir was killed in a collision with a school bus near Córrego Farias south of the Linhares reserve close to the city of Linhares in 1997 (now on display in the Lorenzutti Museum in that city) and one appeared on the south side of the Rio Doce 15 km west of Regência in a time of heavy flooding 15 years ago. These events indicate that tapirs do occasionally try to move away from the reserves, but that these are rare dispersal attempts and the population remains isolated from others in the state.

While hunting pressure was intense in Sooretama in the past, it has dropped since 9-12 guards from the Linhares reserve began helping with the Sooretama patrols. Local people mostly hunt as a leisure activity and although some do hunt for commercial purposes and sport hunters occasionally come from as far as Rio de Janeiro to hunt there, tapirs are rarely the game of choice. The guards believe that this is due to a decrease in the use of hunting dogs (people fear attracting the attention of the guards), and without dogs it is much more difficult to hunt tapirs. Also, they claim that tapirs are too heavy to carry out of the forest discreetly and for this reason are now rarely hunted. The Linhares reserve has been effectively patrolled for many years and by all accounts the tapirs there are well protected.

Caparaó National Park: This 31,800 ha park protects mountain forest and alpine vegetation on a rugged range on the border of Espírito Santo and Minas Gerais, with 70 % of the reserve in the former. The forests of the region have been disturbed for a long time, cleared to make way for cattle pastures and coffee plantations, burned by charcoal makers and wildfires from neighboring pastures. Today the situation has improved and the forest is recovering in the heavily impacted areas. The most intact forests have large trees with an upper canopy of 20-30 m and understory with bamboo as a dominant plant. More disturbed forests, especially those on the higher slopes (>1000 m), consist of secondary growth to 2-5 m with some trees reaching 10-15 m and scattered trees as tall as 20m. Tree ferns are common and mosses and lichens cover most surfaces. Above 2000 m the forest gives way to alpine vegetation (*campos rupestres*). The best preserved forests lie on the steep slopes of the Espírito Santo segment of the park and it is here that tapirs reportedly persist today.

Tapirs were extirpated from the Minas Gerais segment of the park more than 50 years ago and the species was believed to be extinct on the Espírito Santo side as well until scientists found tracks there in 2006 (Edsel Amorim Moraes Jr. pers. com.). The reserve director at first told us that guards have confirmed the species presence there, but later retracted saying that they may have been capybara tracks (*Hydrochoerus hydrochaeris* Linnaeus, 1766). Even if confirmed present, the fact that the animals have remained undetected to the point of people believing they were extinct suggests that the population is small. However, the large size of the reserve gives hope that if the tapirs indeed do exist there, that the population has room to grow. The reserve is surrounded by intensively cultivated and grazed lands and the hunting tradition is strong, so it is unlikely that tapirs will re-colonized or disperse across these landscapes in the future.

Areas of potentially suitable Habitat where Tapirs are absent

Rio Preto National Forest: This national forest (2,830 ha) and contiguous legal reserves of neighboring properties protect 5,000 ha of forest along the Itaúnas River in northern Espírito Santo several kilometers east of BR-

101 in a landscape dominated by eucalyptus plantations and cattle pastures. While this forest suffered selective logging for decades and a fire in 1987 that burned 870 ha, it still retains good stands of mature forest. The forest has few springs and streams apart from the Rio Itaúnas however, and the *mussununga* wetlands are seasonal ponds, so it may not be an ideal site for tapirs. Hunting pressure is still fairly intense but appears to be declining, although it has become a fashion amongst some people in nearby cities (São Mateus) to order game meat from local hunters. The director of the reserve has worked in the reserve for 17 years and has never received any notice and/or record of tapirs in the area.

Santa Teresa region: The two principal reserves in this region are the Augusto Ruschi Biological Reserve (3,600 ha) and the Santa Lúcia Biological Station of the Museu de Biologia Prof. Mello Leitão (460 ha), but there is much forest cover outside of these reserves. A recent GIS analysis by Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) showed that the 36,000 ha landscape surrounding the Augusto Ruschi reserve retains 24,000 ha of mostly contiguous forest and that 70 % of the inter-fragment distances are ≤ 50 m. The highland forests extend south to the Duas Bocas and Pedra Azul reserves and while most of these forests are clearly secondary forests growing on previously cleared land, they occupy an extensive area and forest cover is increasing (mainly due to the dual processes of agriculture intensification and land abandonment). Wildlife populations appear to be recovering in the region, and while hunting is still common, it has decreased greatly in comparison to former times.

According to local people who have lived in the region for decades tapirs were extirpated some 50-60 years ago as in the rest of the highland region. The principal guide of the Mello Leitão museum grew up hunting in these mountains with his father and uncle and never heard of tapirs anywhere near here. Old timers informed Sr. Molina, who has looked after the Santa Lúcia Biological Station for the past 26 years, that tapirs were killed off some 60 years ago. There are several other similar narrations but none has seen any evidence of tapirs or heard of any in the region. There were several recent reports of tapirs but none of the people we spoke with who have experience in the forest believed them to be true. We imagine that these supposed sightings are of capybaras by people from outside the region who are unfamiliar with the fauna.

Duas Bocas Biological Reserve: This 2,900 ha forest near the western edge of the greater Vitoria urban area no longer has tapirs. We interviewed a scientist working there with aquatic animals who spends a great deal of time along the waterways in the reserve and he has never seen any evidence of tapirs or heard of any nearby.

Pedra Azul State Park and other highland areas: As described above, tapirs were extirpated by the mid-20th century throughout this region.

Goytacazes National Forest: The 1,350 ha Goytacazes forest lies along BR-101 just south of Linhares on the Rio Doce in the cacao zone. There is no living memory of tapirs inhabiting the area and as the forest lies on the outskirts of town along a busy highway, it is unlikely that it would make a good site for tapir re-introductions.

Coastal restinga reserves: The Itaúnas State Park protects 3,000 ha of restinga forest and sand dunes at the mouth of the Rio Itaúnas on the northern coast of Espírito Santo in a region dominated by eucalyptus plantations. There is no memory of tapirs there in recent decades. The staff the 833 ha Comboios Biological Reserve, several men in their 50s who were born nearby, have never heard of tapirs in the region. A. Gatti found no evidence of tapirs while working with mammals in the 1,500 ha Paulo Cesar Viana State Park along the southern coast.

Discussion

Movement Barriers isolate the extant Populations

Other than the two cases listed above of tapirs appearing 10+ km south of the Linhares Reserve, there are no reports of tapirs moving any further than a few hundred meters from the forest edge and it is clear that each population is isolated from the other and from the nearest populations in the neighboring states. The landscapes between the three tabuleiro tapir populations are overwhelmingly dominated by cattle pastures and eucalyptus plantations and other agricultural lands that offer little in the way of food or shelter for tapirs. The small, degraded fragments that characterize the forests of these landscapes are not large enough to sustain tapirs even if they did move out of the reserve and the animals would have to constantly be moving between fragments to find the resources necessary to survive. Tapirs can and do eat agricultural crops in northern Espírito Santo (maize, manioc, passion fruit, pumpkins, cacao, young coconut trees, and jackfruit), and the damage they cause can be considerable. Consequently, it is unlikely that they could survive by raiding these crops without coming into conflict with farmers. As hunting is still common in northern Espírito Santo, animals would be vulnerable when they moved between forest patches. The extensive network of barbed wire fences would further impede travel, and a tapir moving between the populations would have to pass hundreds of fences to reach the next population. Highway BR-101 is one of the principal roads of Brazil and traffic is likely to increase in the future, and even though tapirs are still crossing between the Sooretama

and Linhares reserves, these do not appear to be common events and could become rarer in the future if traffic increases and/or the highway is widened. Agricultural land is highly valued in northern Espírito Santo and as this is unlikely to change, the prospects of creating movement corridors to link these disparate populations in the coming decades are slim.

While there is more forest cover in the highlands and several wildlife species are making strong comebacks (e.g. collared peccaries and capybaras), there are no tapirs left nearby to re-colonize these areas. Even if the Caparaó population does exist, it is unlikely to expand beyond the reserve boundaries any time soon, mainly because there is still ample empty habitat within the reserve and because the surrounding landscapes are not conducive to tapir movements being that several busy highways traverse the landscape and the small forest fragments, albeit closely spaced, are unlikely to provide sufficient refuge from hunters.

The Threat of Fire

The main immediate threat to tapirs of the two smaller reserves is catastrophic fires like those that burned much of the forest in 1987. Tapirs survived the 1987 fires presumably by fleeing into the 20 % of the forest that did not burn and then re-colonizing the burned areas as the vegetation recovered. In the event that the entire reserve burns, the tapirs will have no place to seek refuge. Cattle pastures, eucalyptus groves, and sugarcane fields on the edge of the reserve are hazards that should be avoided by creating agroforestry buffer zones that are less likely to catch fire (Cullen *et al.*, 2004) but this is unlikely to happen in the near future because there are no economic incentives for landowners to do so. While fires are also a threat to Sooretama and Linhares reserves, the sheer size of these forests makes it less likely that they will be completely destroyed in the event of a catastrophic fire.

The impact of fire on the persistence of the Espírito Santo tapirs was modeled by Arnaud Desbiez using a Population Viability Analysis (Vortex) with various estimates of population sizes and catastrophic fire frequencies provided from information collected during this study. The results indicate that catastrophic fires are unlikely to directly cause tapir extinctions when population have approximately 200 individuals (probably the upper size limit of the Sooretama/Linhares population), but might cause fluctuations in the number of individuals in the population that would make it more vulnerable to stochastic variables such as disease, hunting pressure and road kill and could increase the chance of erosion of genetic diversity in the long run. In small populations, such as those found in the Córrego do Veado and Córrego Grande reserves, the model exercise indicates that there is a good chance that fires will drive these populations to extinction within 100 years. The modeling results suggest that conservation action to protect the tapirs needs to include strategies to protect these areas from catastrophic fires that are likely to re-occur. This is a real threat that should be addressed as soon as possible.

The Threat of Hunting

Hunting does not appear to be an imminent threat to the Espírito Santo tapirs and as hunting pressure appears to decrease throughout the state, there is hope that the situation will continue to improve and tapir populations will grow in the future. However, animals that raid crops will always be susceptible to retaliation and it is probable that tapirs will occasionally be killed in these circumstances. For the small tabuleiro populations even the loss of one animal could be catastrophic. If hunting pressure decreases further and wildlife protection legislation becomes more effectively enforced, the highland region may be a viable site for tapir re-introductions. The total forest cover in the highland region is already > 100,000 ha and although most of the fragments are small, they are closely spaced and occupy a large percentage of the area and without hunting pressure these landscapes would probably be suitable for tapirs.

Genetic Considerations

The probable large size of the Sooretama/Linhares population and the short time it has been isolated suggests that the deleterious consequences of inbreeding are not an imminent concern. However, the small populations in Córrego Grande and Córrego do Veado suggest that they are unlikely to be viable in the long-term without genetic intervention. While it is likely that the translocation of individuals between populations *could* make these small populations more genetically robust, funding shortage makes it unlikely that translocations will occur in the near future.

Conclusions

- Tapirs are reduced to at least three and possibly four isolated populations, two with probably < 20 animals each, and the other with a potentially robust population of >100 individuals.
- The persistent threat of escaped fires could eliminate the two small populations, but is unlikely to destroy the Sooretama/Linhares (and Caparaó) populations.
- The deleterious genetic effects of isolation are a long-term threat to the two small populations and it may be that we will have to intervene by translocating animals or genetic material between populations if they are to persist. The large population is unlikely to need genetic intervention in the near future.

- The extent of deforestation and forest degradation in the tabuleiro landscape and the high economic value of the land make it unlikely that the low quality matrix that is currently isolating tapirs in reserves will change in any way to improve its permeability for tapirs. Increasing traffic in Brazil and the importance of BR-101 for the national economy suggest that in the future this highway will become even more of a barrier than it is today, especially if it is improved by adding additional lanes (which will eventually happen), and this could impede tapir movements between the Linhares and Sooretama reserves.
- Hunting pressure appears to be declining in the state and this coupled with an increase in forest cover in the highlands gives hope that one day this region will be an appropriate site for tapir re-introductions.

Acknowledgements

We thank Anderson Durão Viana, Ectore Vanelli Bacheti and Rafael Baldini for help in field. We are also indebted to Mr. Angelo Belon, Mr. Elias Lorenzutti, the biologist João Luiz Rosetti Gasparini, Kelé, Rosemberg Ferreira Martins and the local people for information that helped us planning the project. The Instituto Chico Mendes de Conservação da Biodiversidade, Instituto Estadual de Meio Ambiente e Recursos Hídricos and Museu de Biologia Prof. Mello Leitão provided authorization for visiting the reserves an help with logistics. And we thank to IUCN/SSC Tapir Specialist Group for institutional support.

References

Brown, K.S. Jr. & Brown, G.G. 1992. Habitat alteration and species loss in Brazilian forests. In: T. C. Whitmore & J. A. Sayer (eds.) Tropical Deforestation and Species Extinction, pp. 119-142. Chapman Hall, London.

Chiarello, A.G. 1999. Effects of fragmentation of the Atlantic forest on mammal communities in south-eastern Brazil. Biological Conservation 89:71-82.

Cullen, L., Ferreira, L.L. & Pavane, T.B. 2004. Agroforestry Buffer Zones and Stepping Stones: Tools for Conservation of Fragmented Landscapes in the Brazilian Atlantic Forest. In: G. Schroth, G.A.B. da Fonseca, C.A. Harvey, C. Gascon, H.L. Vasconcelos & A.M.N. Izac (eds.) Agroforestry and Biodiversity Conservation in Tropical Landscapes, pp. 415-430. Island Press, Washington D.C.

Dean, W. (1995) *With Broadax and Firebrand - The Destruction of the Brazilian Atlantic Forest*. University of California Press, Berkeley.

Garay, I., Rizzini, C.M., Kindel, A., Agarez, F.V., Passos, M.A.L., Santos, dos R.D. & Sanchez, V.R. 2003. *A Floresta Atlântica de Tabuleiros: Diversidade Funcional da Cobertura Arbórea*. Editora Vozes, Petrópolis, Rio de Janeiro.

Lorenzutti, R. & Almeida, A. de P. 2006. A Coleção de Mamíferos do Museu Elias Lorenzutti em Linhares, Estado do Espírito Santo, Brasil. Boletim do Museu de Biologia Prof. Mello Leitão 19: 59-74.

SOS Mata Atlântica/INPE. 2002. Atlas dos remanescentes florestais e ecossistemas associados no domínio da Mata Atlântica. Fundação SOS Mata Atlântica, São Paulo.

Viana, V.M. & Tabanez, A.A.J. 1996. Biology and conservation of forest fragments in the Brazilian Atlantic moist forest. In: J. Schelhas & R. Greenberg (eds.) Forest Patches in Tropical Landscapes, pp. 151-167. Island Press, Washington, D.C.

Appendix 1: Spatial relationship of the tapir populations.

Population	Distances between tapir populations	Landscape mosaic between the populations	Evidence of tapir movements
Córrego Grande	50 km to Córrego do Veado; 130 km to the Descobrimento National Park population in Bahia.	Eucalyptus and sugarcane plantations and cattle pastures. Fences with barbed wire and in the direction of the Córrego do Veado population the busy BR-101. Forest cover throughout is sparse and reduce to small (mostly 1-4 ha) widely spaced (500-1000+ m) fragments, with few fragments >20 ha.	No
Córrego do Veado	50 km to Córrego Grande; 60 km to the Sooretama/ Linhares population.	The landscape between this reserve and Sooretama is dominated by cattle pastures, with lesser amounts of eucalyptus, coffee, sugarcane, maize, and black pepper. Many barbed wire fences and several fairly busy highways. Forest cover is reduced to widely spaced (500-1000+ m) degraded fragments (1-10 ha).	No
Sooretama and Linhares	60 km to Córrego do Veado; 175 km to Caparaó.	Eucalyptus, cattle, coffee, cities, highways and heavily fragmented forest reduced to small, degraded fragments. Highlands of highly contiguous fragments of secondary forest.	No
Caparaó	100 km from Rio Doce State Park in Minas Gerais; 175 km to Sooretama.	Coffee, cattle, and small highly degraded forest fragments.	No

Sugarcane Pre-harvest Burning: A Threat to Megafaunal Conservation in Brazil?

Olivier Cameron Trudel[1], Marianne Bachand[1], Colette Ansseau[1], Jarcilene Almeida-Cortez[2]*

[1] Département d'Écologie, Université de Sherbrooke, 2500 Av. Université, Sherbrooke, J1K 2R1, Québec, Canada
[*] Corresponding author, E-mail: Olivier.C.Trudel@USherbrooke.ca
[2] Departemento de Botânica, Universidade Federal de Pernambuco, Av. Prof. Moraes Rego, 1235 Cidade Universitária, Recife, CEP 50670-901 Pernambuco, Brazil

Introduction

The Lowland tapir, *Tapirus terrestris*, listed as vulnerable in the IUCN red list (2009), and classified in section II by the CITES (2009), is scarce in many regions of Brazil. Although this species is not included in the threatened species list of the IBAMA (Ministério do meio ambiente 2003), it is reported in six of seven Brazilian state lists of animals threatened with extinction (Medici et al. 2007). This specie situation is principally due to habitat loss and poaching (IUCN 2009). Since the Lowland tapir may be considered a keystone species because of its role of seed-disperser (Galetti et al. 2001, Fragoso et al. 2003), its extirpation from a forest ecosystem may potentially have a subtantial impact on the recruitment dynamics of some vegetal species.

Historically, an important part of the Atlantic coastal forest has disappeared under the sugarcane agricultural regime, which creates habitat loss and fragmentation (Oliveira et al. 2004, Tabarelli et al. 2006). Sugarcane pre-harvest burning (SPB) is a common practice mainly used to increase harvest efficiency (Müller & Coetsee 2008). This exploitation technique is still required because a significant proportion of sugarcane fields are harvested by hand. Sugarcane fields are burned before harvesting to reduce harvest time and cost by eliminating leaves that slow harvesters. SPB also enhance the security of harvesters by killing snakes (Mbolidi-Baron et al. 2007). Although, it has advantages for famers, the use of SPB is actually socially controversial (Mbolidi-Baron et al. 2007) because of its environmental impacts (Oppenheimer et al. 2004, Lara et al. 2005, Hemwong et al. 2009) and because it may threaten the health of exposed populations (Cançado et al. 2006, Uriarte et al. 2009).

Results obtained in Ilha Grande National Park forest showed that intensive and extensive wildfires have the power to affect terrestrial reptiles and mammals both directly and indirectly (Koproski 2005). Most fires also have the potential to injure or kill fauna (U.S. Fish & Wildlife Service 2009). The destructive effect of fire has already been observed on many terrestrial large-bodied mammals (French & French 1996, Oliver et al. 1998).

Keywords: Atlantic forest, Conservation, Fire, Fragmented area, *Tapirus terrestris*

Observations

Observations were made during the fieldwork of a research project on the diet of Lowland tapirs (Bachand et al. 2009). The project was conducted in a fragment of the Northeastern Atlantic Forest, Mata dos Pintos, located on the property of Usina Serra Grande™, Alagoas, Brazil (8°58 S, 36°6 W). We discovered a tapir's resting and foraging site in a sugarcane field. Later that month in the same field, we observed a resting tapir that fled when surprised (3:45 PM, September 2006). We then investigated further and discovered numerous tapir resting sites in the field's borders and a complex network of trails in the field merging to the forest fragment at some points.

Unfortunately, one month after our ethological observations (October 2006), an immature female tapir of the studied population was burnt by a SPB in the same field we had investigated. It later received care from the warden and treatment from a veterinarian, before succumbing one month later. We hypothesized that this unfortunate accident was not an isolated case; other tapirs in the sugarcane production region may have been exposed to SPB.

Survey

We contacted 34 wildlife rehabilitation centers in Brazil (mostly CETAS and IBAMA) to find out if they were aware of similar cases (without taking into account if the region supported natural tapir populations, or was a sugarcane field-dominated landscape). Only 14 centers answered; none have ever received a tapir injured by a SPB, nor by a wild fire.

Almost one hundred sugarcane companies and company divisions in Brazil were contacted for the same purpose. The only answer we received was from a company located in the Goias state. This ISO 14001 certified company, which only burns 10 % of its area, told us that they ensure that no animal is in the field before burning. However, we speculate that this statement is based on inconclusive evidence.

Discussion

During several seasons of a monitoring study in Morro do Diabo State Park, Medici and her colleagues also found a series of intricate trails crossing sugarcane fields. Other trails were found entering surrounding forest fragments and roaming through the sugarcane lines. Although two radio-collared tapirs crossed this sugarcane field almost every night, they appeared to never spend much time in the sugarcane. No tapir couches or eaten sugarcane stems were found by Medici and her peers during their research (Medici, pers. com. 2009).

A study on wildfire impacts on megafauna in the Emas National Park (Brazil) mentions one carcass of a juvenile Lowland tapir killed by an important fire in the park (also 16 giant anteaters (*Myrmecophaga tridactyla* L.) carcasses) (Silveira et al. 1999). Silveira and his colleagues stipulate that tapir are less vulnerable to fire, probably because they can detect fire and run from the flame more rapidly. Koproski (2005) observed a tapir that appeared unalarmed despite the intensity of the fire beside it in the Ilha Grande National Park, consequently to other large mammals species (Lyon et al. 2000). Large mammal mortality most likely occurs when fire fronts are wide and fast-moving, when fires are actively crowning, and thick ground smoke occurs (Singer and Schullery 1989), which may correspond to the SPB fire behavior.

There are few studies on the impact of fire on fauna. Due to the status of the species and its ecological role, we found it essential to share this report with the scientific community to strongly encourage further researches testing the validity of our hypothesis. If this sugarcane crossing, feeding and resting behaviors are wide spread in tapir populations at the landscape scale, it may be necessary to outline adequate management solutions to reduce mortality risk in sugarcane field mosaics. We explore here three possible solutions to mitigate the potential of megafaunal mortality related to SPB. We stress that this is especially important for the conservation of large mammals (e.g., tapir, giant anteater), which generally have limited population size, extended home-ranges, and slow reproduction rates (long gestation, few young, and long parental care period).

Solutions

SPB Reduction

The first solution we propose is to reduce the frequency of SPB as a global effort of sustainability. The Sugar Cane Industry Union of Brazil (almost 100 mills united), UNICA, signed an agreement with the Environment Secretariat for the State of Sao Paulo to bring forward the end of sugarcane burning to 2014, as well as the end of manual cutting, in the majority of plantations (UNICA 2009). Hopefully, sugarcane growers in the North-East of Brazil will reproduce this great decision for sustainability in the future.

SPB Alarm

A potentially efficient solution to mitigate SPB risks could be based on the tapir's great acuteness of hearing. Producing loud noises from different locations in the field before lighting SPB may help to reduce the risk of accidents. Noises could be produced by clapping hands, shouting, emitting an alarm, honking a horn, and by knocking machetes or shovels together. This simple solution represents a rapid and cost-free method to make animals flee from a field, and it can be applied by harvesters without special equipment.

Firebreak around Canefield

A SPB out-of-control is potentially an important threat for fauna even outside of the burnt sugarcane field. Moreover, reducing the loss of Lowland tapir habitat due to fires is a priority goal for Brazil, especially outside of protected areas (Medici et al. 2007). Keeping a firebreack consisting of cut herbaceous vegetation around the field may reduce the risk of fire propagation when using SPB in fields near forest fragments.

Conclusion

Since the pre-harvest burning method in sugarcane fields (and other types of crop burning) will probably continue to be used for many years, we encourage researchers to carry out studies that could help to assess the impact of this agricultural technique.

Acknowledgments

We want to thank the Usina Serra Grande for substancial logistic support during the fieldwork and José Clodoaldo for his generosity. Special thanks to Sabrina Plante for her great implication in the project. We are very thankful to the conservation fragment warden, Mr. Çico Oliveira da Silva, who shared with us his knowledge on the resident tapirs, and gave first aid to the burnt tapir. Finally, we would like to thank Doc. Vet. Erivan Luiz Pereira de Andrade, who tried everything he could to save the animal.

References

Bachand, M., Trudel, O.C., Ansseau, C. & Almeida-Cortez, J. 2009. Dieta de *Tapirus terrestris* Linnaeus em um fragmento de Mata Atlântica do nordeste do Brasil. Rev. Bras. de Bioci. 7:188-194.

Cançado, J.E.D., Saldiva, P.H.N., Pereira, L.A.A, Lara, L.B.L.A., Artaxo, P., Martinelli, L.A., et al. 2006. The impact of sugar cane-burning emissions on the respiratory system of children and the elderly. Environ. Health Perspect. 114:725-729.

CITES (2009) *Convention on International Trade in Endangered Species of Wild Fauna and Flora, Appendices I, II and III*. Http://www.cites.org/eng/app/appendices.shtml [accessed 24 Mars 2010].

Fragoso, J.M.V., Silvius, K.M. & Correa, J.A. 2003. Long-distance seed dispersal by tapirs increases seed survival and aggregates tropical trees. Ecology 84:1998-2006.

French, M.G. & French, S.P. 1996. Large mammal mortality in the 1988 Yellowstone fires. In: 2nd Biennial Conference on the Greater Yellowstone Ecosystem, Yellowstone National Park, pp.113-115. International Association of Wildland Fire, Birmingham, AL, U.S.

Galetti, M., Keuroghlian, A., Hanada, L. & Morato, M.I. 2001. Frugivory and seed dispersal by the Lowland tapir (*Tapirus terrestris*) in Southeast Brazil. Biotropica 33: 723–726.

Hemwong, S., Toomsan, B., Cadisch, G., Limpinuntana, V., Vityakon, P. & Patanothai, A. 2009. Sugarcane residue management and grain legume crop effects on N dynamics, N losses and growth of sugarcane. Nutr. Cycl. Agroecosyst. 83:135-151.

IUCN (2009) *2009 IUCN Red List of Threatened Species*. Http://www.iucnredlist.org. [accessed 24 Mars 2010].

Koproski, L.P. 2005. O fogo e seus efeitos sobre a herpeto e a mastofauna terrestre no parque nacional de ilha grande (PR/MS), Brasil. M.S. thesis. Universidade Federal do Paraná, Curitiba, PR, Brazil.

Lara, L.L., Artaxo, P., Martinelli, L.A., Camargo, P.B., Victoria, R.L. & Ferraz, E.S.B. 2005. Properties of aerosols from sugar-cane burning emissions in southeastern Brazil. Atmos. Environ. 39:4627-4637.

Lyon, L.J., Telfer, E.S., and Schreiner, D.S. 2000. Direct effects of fire and animal responses. In: Smith, J.K. (eds.). Wildland fire in ecosystems: effects of fire on fauna. General Technical Report RMRS-GTR-42, volume 1. United States Department of Agriculture-Forest Service, Rocky Mountain Research Station, Ogden, Utah, U.S.

Mbolidi-Baron, H., Sainte, E.M., Bellassée, P. & Schneider, M. 2007. Le brûlage de la canne à sucre en Martinique : évolution, motivations, impacts. De la nécessité d'un engagement collectif. Recueil des communications. 8ème Journée Technique de l'AMADEPA, Martinique.

Medici, E.P., Desbiez, A.L.J., Gonçalves da Silva, A., Jerusalinsky, L., Chassot, O., Montenegro, O.L., et al. (Eds.). 2007. Lowland tapir Conservation Workshop: Final Report. IUCN/SSC Tapir Specialist Group (TSG) & IUCN/SSC Conservation Breeding Specialist Group (CBSG) - Brazil.

Ministério do meio ambiente. 2003. Lista nacional das espécies da fauna brasileira amaçeadas de extinção. MMA, Brasília, Brazil.

Müller, M.L. & Coetsee, M.F. 2008. Physiological demands and working efficiency of sugarcane cutters in harvesting burnt and unburnt cane. Int. J. of Ind. Ergon. 38:314-320.

Oliveira, M.A., Grillo, A.S. & Tabarelli, M. 2004. Forest edge in the brazilian Atlantic forest: drastic changes in tree species assemblages. Camb. Univ. Press 38:389-394.

Oliver, C.D., Osawa, A. & Camp, A. 1998. Forest dynamics and resulting animal and plant population changes at the stand and landscape levels. J. of Sustain. For. 6: 281-312.

Oppenheimer, C., Tsanev, V.I., Allen, A.G., Mcgonigle, A.J.S., Cardoso, A.A., Wiatr, A., et al. 2004. NO_2 emissions from agricultural burning in São Paulo, Braz. Environ. Sci. & Technol. 38:4557-4561.

Silveira, L., Rodrigues, F.H.G., Jacomo, A.T.A. & Filho, J.A.F.D. 1999. Impact of wildfires on the megafauna of Emas National Park, Central Brazil. Oryx 13:362-371.

Singer, F.J. & Schullery, P. 1989. Yellowstone wildlife: populations in process. West. Wildlands 15:18-22.

Tabarelli, M., Melo, M.D.V.C., & Lira, O.C. 2006. A mata Atlântica do Nordeste. In: M. Campanili & M. Prochnow (eds.). Mata Atlântica: Uma rede pela floresta. Rede de ONGs da Mata Atlântica (RMA), Brasília, Brazil. 332p.

U.S. Fish & Wildlife Service (2009) *Managing Invasive Plants: Concepts, Principles, and Pratices. Management Methods: Prescribed Burning*. Http://www.fws.gov/invasives/staffTrainingModule/methods/burning/introduction.html. [accessed 24 Mars 2009].

UNICA. 2009. *Sugarcane Industry Association. In the media: Brazilian ethanol attracts bioplastics investors.* Http://english.unica.com.br/clipping/show.asp?cppCode=E10FE44F-1CD6-4567-9BBD-1219DB1209F4. [accessed 24 Mars 2009].

Uriarte, M., Yackulic, C.B., Cooper, T., Flynn, D., Cortes, M., Crk, T., Cullman, G., McGinty, M. & Sircely, J. 2009. São Paulo, Brazil: Implications for fire occurrence and respiratory health. Agric., Ecosyst. and Environ. 132: 48-56.

Proyecto de Educación Ambiental "Conociendo al Tapir. El Gigante Perdido de la Fauna Tucumana", Argentina

Juan Pablo Juliá[1], Pablo Adrián Quiroga[1], Ana Paula López[1]*

[1] Reserva Experimental Horco Molle, Facultad de Ciencias Naturales e IML, Universidad Nacional de Tucumán. Miguel Lillo 205, 4000, Tucumán, Argentina
[*] Corresponding autor, IUCN/SSC TSG, E-mail: jupaju@yahoo.es

Introducción

La Reserva Experimental Horco Molle (REHM) de la Facultad de Ciencias Naturales e IML de la Universidad Nacional de Tucumán (UNT), desarrolla durante este año el proyecto de Educación Ambiental (EA) "Conociendo al Tapir. El Gigante Perdido de la Fauna Tucumana". El mismo cuenta con financiamiento de la Secretaría de Bienestar Universitario y el auspicio y colaboración de numerosas instituciones universitarias, provinciales y ONGs (ver lista al final).

La REHM está ubicada en el departamento Yerba Buena, en el extremo norte de las "lomas de Imbaud" (26º 48´S 65º 19´O), localidad de Horco Molle, 15 Km. al oeste de la capital de la provincia de Tucumán, Argentina. Limita al este con un importante núcleo urbano en constante expansión (ciudad de Yerba Buena) y al oeste con una de las áreas protegidas de mayor importancia de la provincia, el Parque Sierra de San Javier (PSSJ) de la UNT (14.174 has.). Posee una superficie de 200 has. de las cuales 18 has. corresponden al "cercado de manejo y exhibición de fauna" y el resto está ocupado por vegetación secundaria y algunas viviendas dispersas. La vegetación original de la zona corresponde a la Selva Pedemontana de la provincia fitogeográfica de Las Yungas (Cabrera, 1976).

La REHM tiene por objetivos principales la Educación Ambiental y extensión al medio, el funcionar como laboratorio de campo de la Facultad de Ciencias Naturales e IML y el rescate y rehabilitación de fauna, aspecto este último, que incluye objetivos de conservación *ex situ* de fauna autóctona amenazada. La REHM aspira, en el mediano plazo, a desarrollar un programa de reintroducción del tapir en la provincia de Tucumán. Actualmente participa del proyecto de conservación *ex situ* del tapir en Argentina, el cual está a cargo de los miembros del Tapir Specialist Group de la IUCN (TSG – IUCN) en el país.

El tapir o anta (*Tapirus terrestris*), ha sufrido un acelerado retroceso numérico y espacial en este siglo en Argentina (Roig, 1988; Richard y Juliá, 2000). Actualmente está considerado En Peligro en nuestro país (Barquez *et al.*, 2006). Sobrevive con poblaciones reducidas en el norte Argentino ocupando el este de las provincias de Salta y Jujuy, límite noreste de Santiago del Estero y norte de Formosa, Chaco y Misiones. Está extinto en las provincias de Corrientes, Entre Ríos y Tucumán, mientras que está probablemente extinto en la provincia de Santa Fe. Las causas de la desaparición del tapir en Tucumán, alrededor de la década del 40 (Lucero, 1983), fueron la caza y destrucción de su hábitat (García, 1972). El tapir es una especie particularmente sensible a la sobre caza, como consecuencia de sus bajas densidades y tasas reproductoras (Bodmer *et al.*, 2000). Esto pone de relieve la importancia de la EA como herramienta previa a cualquier tipo de programa para reintroducción la especie.

Fundamentos del Proyecto

El tapir ha sido postulado recientemente como una especie "arquitecta" de los ecosistemas en donde habita, lo que pone de relieve su importancia ecológica. La posibilidad de que esta especie sea clave en el mantenimiento de la dinámica de los ecosistemas en que habita, aumenta la necesidad de recuperar sus poblaciones allí donde ha declinado o ha desaparecido. Además posee un gran valor étnico y cultural, por estar presente en la simbología y mitologías indígenas.

Por otro lado, por tratarse de unos de los mayores mamíferos autóctonos del continente y por su peculiar aspecto, reúne las condiciones necesarias para convertirse en una especie bandera. Todo esto puede potenciar notablemente, una mayor conciencia ambiental en torno al tapir y su medio.

La Universidad Nacional de Tucumán, en la figura de la REHM, en uno de los principales centros de

Argentina, en cuanto a número de crías de tapir nacidas en cautiverio. Actualmente tiene la oportunidad de liderar el primer programa de reintroducción de tapires a su medio natural en el ámbito de sus propias reservas. Los programas de reintroducción, son proyectos largos y complejos, que requieren de un financiamiento a largo plazo y la implicación y apoyo de la sociedad. Es por ello que, un paso previo y fundamental, es la etapa de concientización y EA que prepare a la sociedad y optimice los recursos a destinar para tal empresa.

Objetivo General del Proyecto

- Generar en la sociedad, una imagen positiva sobre el tapir o anta, instituyéndolo como una especie bandera para la conservación, para sentar las bases de un futuro proyecto de reintroducción en la provincia de Tucumán.

Objetivos Específicos

- Conformar un centro de EA con el tapir como una especie emblemática.
- Capacitar a voluntarios para el apoyo en las tareas de difusión y Educación Ambiental.
- Realizar campañas de difusión y EA sobre el tapir y su entorno, tanto en ámbitos formales como no formales de la sociedad.

Resultados Esperados

- El proyecto busca consolidar y formar un grupo de voluntarios eco-ambientales para la promoción de la conservación del tapir. Se prevé capacitar más de 100 voluntarios y 10 coordinadores de voluntarios en el primer año. Se darán talleres y cursos de EA sobre el tapir y problemáticas medio ambientales a más de 1000 alumnos de nivel medio durante este año. Paralelamente se pretende instaurar al tapir como especie bandera de la conservación en la sociedad, pregonando su biología, comportamiento y su importancia para los ecosistemas locales.
- Consolidar un grupo de Educación Ambiental y capacitación docente permanente en la REHM.
- Editar material pedagógico en formatos escrito y audiovisual.
- Capacitación de docentes de todos los niveles educativos de la provincia.
- Realizar experiencias prácticas, mediante campamentos educativos en el ambiente del tapir, con el tapir como eje transversal.

Instituciones Participantes

- Reserva Experimental Horco Molle.
- Secretaría de Bienestar Universitario, Rectorado de la UNT.
- Parque Sierra de San Javier de la UNT.
- Dirección de Medio Ambiente de la Provincia de Tucumán.
- Dirección de Flora, Fauna Silvestre y Suelos de la Provincia de Tucumán.
- Asociación Civil PRO-ECO Grupo Ecologista.

Referencias

Barquez, R.M., Díaz, M.M. & Ojeda, R. A (eds). 2006. Mamíferos de Argentina. Sistemática y distribución. Sociedad Argentina para el Estudio de los Mamíferos, Argentina.

Cabrera, A.L. 1976. Regiones Fitogeográficas Argentinas. Enciclopedia Argentina de Agricultura y Ganadería, Tomo 2(1).

Bodmer, R.E., Aquino R. & Gil Navarro, J.G. 2000. Sustentabilidad de la caza de mamíferos en la cuenca del río Samiria, amazonia peruana. In Cabrera, E., Mercolli, C. & Resquin, R. (eds.). Manejo de Fauna Silvestre en Amazonía y Latinoamérica. CITES Paraguay, Fund. Moisés Bertoni y University of Florida, Asunción.

García, A.I. 1972. El ambiente natural de Tucumán en el siglo XVI a través de los cronistas y documentos de la época. An. Soc. Arg. Est. Geogr. 15:174-192.

Lucero, M.M. 1983. Lista y distribución de aves y mamíferos de la provincia de Tucumán. Miscelánea 75, FML.

Richard, E. & Juliá, J.P. 2000. El Tapir (*Tapirus terrestris*): Dieta y manejo en un bosque secundario de la ecoregión de selvas pedemontanas. Estatus en Argentina. In Cabrera, E., Mercolli, C. & Resquin, R. (eds.). Manejo de Fauna Silvestre en Amazonía y Latinoamérica. CITES Paraguay, Fund. Moisés Bertoni y University of Florida, Asunción.

Roig, V.G. 1988. Los estudios faunísticos de las regiones áridas y su contribución a las investigaciones arqueológicas (Distribuciones actuales e históricas de algunos mamíferos). Xama 1:17-42.

Tapir Conservation National Action Plan in Ecuador

Fernando Nogales-Sornoza[1], Leonardo Ordoñez[2], Andrés Tapia[3]

[1] Coordinador Nacional del TSG-Ecuador. Universidad Técnica Particular de Loja (UTPL). Quito–Ecuador, E-mail: fernogales@yahoo.com; fbnogales@utpl.edu.ec
[2] Coordinador Nacional del TSG-Ecuador. Fundación Ecológica Arcoíris. Loja – Ecuador. E-mail: leo_od7@yahoo.es; tsg.ecuador@gmail.com
[3] Miembro del TSG- Ecuador. Centro Tecnológico de Recurso Amazónicos de la Organización de Pueblos Indígenas de Pastaza (OPIP) – Centro Fátima. E-mail: sachacristo@gmail.com

Background

The process to make a successful National Action Plan for tapir conservation in Ecuador began after our participation in the Mountain Tapir Population and Habitat Viability Assessment, held in Pereira, Colombia in 2004. During this meeting, the members of the TSG-Ecuador, realized the importance of developing a conservation plan to guide the main conservation actions for the three tapir species in Ecuador. Some years later, as a result of the Lowland Tapir PHVA and the Third and Fourth International Tapir Symposiums, the idea to formulate a National Tapir Conservation Action Plan had matured. Following this, many meetings and national workshops have been held in Ecuador, to enable us to develop our national action plan for Ecuador.

The Process to produce the National Action Plan

The idea to develop a national tapir conservation action plan was concretized in 2005 through a study undertaken by Natalia Torres and Ana Correa, two of our TSG members and students of the Universidad Técnica Particular de Loja (UTPL). The study was targeted researchers, park rangers, decision makers, environmental authorities, zoos and breeding and rescue centers as well as other actors involved in tapir conservation in Ecuador. These study design was based on previous methodologies used to develop the Argentinean and Colombian National Action Plans and, we enjoyed extensive technical support from Silvia Chalukian and Olga Montenegro. Furthermore, we had solid institutional support from the Environmental Ministry of Ecuador (MAE) with the help of Gabriela Montoya.

During the preliminary process we compiled existing information regarding the status of tapirs from all people involved in conservation of the three tapir species in Ecuador. By the end of 2007 we produced the first draft of the national tapir conservation action plan. Simultaneously, we continued to discuss tapir conservation with environmental authorities of MAE, IUCN representatives and members of the TSG in order to plan immediate and future activities, consolidate the process and engage more institutions, potential donors and sponsors and decision makers.

The final draft was sent to national and international researchers and tapir specialists in order to get feedback and suggestions of how it could possibly be improved? Ensuring that contributions followed participative and consensus driven approach we formulated five strategic guidelines for tapir conservation: i) *Ex-situ* conservation, ii) *In-situ* conservation, iii) Environmental education and communication, iv) Policy and legislation and v) Institutional enforcement.

Workshops for Validation of the National Tapir Conservation Action Plan

A National Workshop for the Validation of the National Tapir Conservation Action Plan was held on the 8th and 9th of May, 2009, in Baños de Agua Santa, Tungurahua-Ecuador.

The meeting gathered 45 participants from a wide variety of sectors i.e. researchers, local communities, TSG members, veterinarians, zoos and rescue centers representatives, environmental authorities and park rangers. The main task during the workshop was to review each one of the five strategic guidelines, review and discuss the IUCN-listing of Ecuador's three tapir species and strengthen inter-institutional partnerships between all stakeholders of tapir conservation in the

country. We applied a participative methodology with working groups and plenary, and then prioritized conservation actions, resulting in seven specific goals and 32 priority conservation actions necessary to ensure the existence and survival of viable population of the three tapir species in Ecuador in perpetuity.

More recently, the draft National Tapir Conservation Action Plan was sent for a final revision to ensure that it had captured all the development processes and conservation priorities. The final version of the National Tapir Conservation Action Plan is expected to be printed at the end of March 2010, and officially presented at Government Level during the next few months. It is important to remark that the action plan is supported by the Environmental Ministry of Ecuador and will be recognized in the Official Register of the National Constitution of the Republic of Ecuador. This will allow conservationists, land-use planners and researchers to be guided by a plan that is statutory and, consequently, a huge boost for tapir conservation in the country.

Lessons Learned

An effective process to build a national conservation strategy should involve decision making bodies like the Environmental Ministry and IUCN at an early stage in the process, because these entities are responsible for adjusting and/or amending the legislative framework to support the implementation of wildlife conservation in Ecuador, for example, the National Tapir Action Plan. Simultaneously, it is essential to maintain a continuous communication and exchanging of ideas and experience with all stakeholder involved in biodiversity conservation, in this case, particularly concerning tapirs.

It is important that the benefits and opportunities of a species national action plan are articulated clearly to sponsors and donors during the development process, which allows for the establishment of cross-sectoral strategic alliances and partnerships. An early inclusion of these stakeholders allows them to share and appreciate the relevance of the objectives, goals and results of such plans in wildlife conservation and how it benefits overall sustainable development.

The foundation in producing the National Tapir Conservation Action Plan was the preliminary study that compiled the existing knowledge about tapirs, synthesized tapir conservation experiences and allowed us to undertake technical surveys and interviews with specialists, facilitating the next steps needed to formulate the action plan. Thus, students and researchers are key actors in driving the entire process.

A participative process that engages key stakeholders concerned with tapir conservation is one of the main tasks of action planning. Here, discussions and analyses can take place in a collective forum that allows participants to get familiar with the initial idea of a national action plan, as well as how to develop and implement it. It will encourage all stakeholders to engage more in tapir conservation, which the priority action steps more realistic and, consequently, the plan easier to implement.

Acknowledgements

We would like to express our gratitude to all those people that contributes to developing our National Tapir Conservation Action Plan. Universidad Técnica Particular de Loja UTPL, Maestría en Biodiversidad de Áreas Tropicales y su Conservación MBATC, Universidad Central del Ecuador UCE, Consejo Superior de Investigaciones Científicas de España CSIC, Ministerio de Ambiente-Dirección Provincial Pastaza, EcoCiencia and UICN-Sur supported the publication of the action plan. The Official Register of the action plan into the National Constitution of Ecuador has been promoted by Ministerio de Ambiente del Ecuador after extensive collaboration with Gabriela Montoya. The first draft of the action plan was research conducted by Natalia Torres and Ana Correa in order to fulfill requirements for their graduate studies at UTPL. Diego Tirira, Galo Zapata, Luis Albuja, Craig Downer, Armando Castellanos, Luis Sandoval, Víctor Utreras, Andrew Noss, Viviana Quse, Olga Montenegro, Gabriela Montoya, Jaime Camacho, Natalia Torres, Fausto López and Grace Sigüenza made extensive and valuable revisions of the strategy. The workshop for validation of the action plan was supported financially and logistically by TSG, MAE, UICN-Sur through its Cuenta Atrás 2010 program, Centro Experimental Fátima, US Fishing and Wildlife Service, EcoCiencia through its Programa de Becas de Investigación para la Conservación de Especies Amenazadas „Fernando Ortiz Crespo“, WWF Education for Nature Program, MBATC, CSIC, UCE, Conservation Internacional, Wildlife Conservation Society, Proyecto de Conservación del Tapir Andino PCTA, Finding Species, Fundación Óscar Efrén Reyes and Municipio de Baños de Agua Santa. Special thanks to Marcelo Guevara, Miguel Zuñiga (The Nature Conservancy) and Claudia Ramon (distribution maps of species of tapirs for Ecuador).This workshop had not been possible without the participation of all the representatives from institutions, re search centers, local communities, park rangers, local authorities, environmental delegates, NGOs, zoos, breeding and rescue centers. Finally, our sincere appreciation and recognition goes to the TSG for generating forums that promoted the idea to develop this action plan and Patricia Medici for sharing with us her enthusiasm for tapir conservation.

Figure 1. Fernando Nogales (TSG country coordinator) presenting the National Action Plan.

Figure 2. Defining threat categories for tapir species during the workshop (Arturo Mora, UICN).

Figure 3. Working groups analyzing the strategic guidelines of the plan.

Figure 4. Delegates from different countries in consulation.

Figure 5. Poster of Tapir Conservation Workshop held in Ecuador 2009, designed by Finding Species Inc.

Figure 6. Workshop`s participants. Baños de Agua Santa, Tungurahua-Ecuador 2009 (in the middle: Felipe, the mountain tapir).

TSG MEMBERSHIP DIRECTORY

TAPIR SPECIALIST GROUP

Currently, the TSG has 113 members, including field researchers, educators, veterinarians, governmental agencies and NGO representatives, zoo personnel, university professors and students, from 27 different countries worldwide (Argentina, Australia, Belize, Bolivia, Brazil, Canada, Colombia, Costa Rica, Denmark, Ecuador, France, French Guiana, Germany, Guatemala, Honduras, Indonesia, Malaysia, Mexico, Myanmar, Republic of Panama, Paraguay, Peru, Thailand, The Netherlands, United Kingdom, United States, and Venezuela).

ABD GHANI, SITI KHADIJAH (Malaysia)
Public Service Department of Malaysia
E-mail: nctapir@gmail.com

AMANZO, JESSICA (Peru)
Universidad Peruana CayetUmano Heredia
E-mail: jessica_amanzo@yahoo.com; jessica.amanzo@leb-upch.org

AMORIM JR., EDSEL (Brazil)
Instituto Biotrópicos
E-mail: edsel@biotropicos.org.br; edsel.bhz@terra.com.br; edselbio@gmail.com

AÑEZ GALBAN, LUIS GUILLERMO (Venezuela)
Fundación Parque Zoológico Metropolitano del Zulia
E-mail: galbanluis70@hotmail.com; galbanluis97@yahoo.com

ANGELL, GILIA (United States)
Amazon.com
E-mail: gilia_angell@earthlink.net

ARIAS ALZATE, ANDRÉS (Colombia)
Grupo de Mastozoología - CTUA, Universidad de Antioquia
E-mail: andresarias3@yahoo.es

AYALA CRESPO, GUIDO MARCOS (Bolivia)
WCS - Wildlife Conservation Society - Bolivia
E-mail: gayala@wcs.org; guidoayal@gmail.com

BARONGI, RICK (United States)
Houston Zoo Inc. / AZA Tapir TAG
E-mail: rbarongi@houstonzoo.org

BECK, HARALD (United States)
Towson University
E-mail: hbeck@towson.edu

BERMUDEZ LARRAZABAL, LIZETTE (Peru)
Parque Zoologico Recreacional Huachipa
E-mail: lizettelarrazabal@yahoo.com

BERNAL RINCÓN, LUZ AGUEDA (Colombia)
Mountain Tapir Project
E-mail: aguedabernal@gmail.com

BODMER, RICHARD E. (United Kingdom)
DICE, University of Kent
E-mail: R.Bodmer@ukc.ac.uk

BOSHOFF, LAUTJIE (Costa Rica)
Rafiki Safari Lodge
E-mail: lautjie@gmail.com

CALMÉ, SOPHIE (Canada)
Université de Sherbrooke, Canada / El Colegio de la Frontera Sur (ECOSUR)
E-mail: sophie.calme@gmail.com; sophie.calme@usherbrooke.ca; scalme@ecosur.mx

CALVO DOMINGO, JOSÉ JOAQUÍN (Costa Rica)
Sistema Nacional de Áreas de Conservación, Ministerio del Ambiente y Energía (MINAE)
E-mail: joaquin.calvo@sinac.go.cr

CAMACHO, JAIME (Ecuador)
Fundación Ecuatoriana de Estudios Ecológicos - EcoCiencia
E-mail: tulias@hotmail.com

CARTES, JOSÉ LUIS (Paraguay)
Asociación Guyra Paraguay
E-mail: jlcartes@guyra,org,py; jlcartes@gmail.com

CASTELLANOS PEÑAFIEL, ARMANDO XAVIER (Ecuador)
Fundación Espíritu del Bosque
E-mail: iznachi@yahoo.com.mx

CHALUKIAN, SILVIA C. (Argentina)
Proyecto de Investigación y Conservación del Tapir Noroeste Argentina
E-mail: schalukian@yahoo.com.ar

COLBERT, MATTHEW (United States)
University of Texas at Austin
E-mail: colbert@mail.utexas.edu

CRUZ ALDÁN, EPIGMENIO (Mexico)
Instituto de Historia Natural y Ecología
E-mail: ecruz5910@prodigy.net.mx; pimecruz5910@hotmail.com

CUARÓN, ALFREDO D. (Mexico)
SACBÉ - Servicios Ambientales, Conservación Biológica y Educación
E-mail: cuaron@gmail.com; alfredo@multicriteria.org

de THOISY, BENOIT (French Guiana)
Kwata Association
E-mail: thoisy@nplus.gf; bdethoisy@pasteur-cayenne.fr

DEE, MICHAEL (United States)
AZA Tapir TAG
E-mail: mjdrhino@yahoo.com

DELLA TOGNA, GINA (Panama)
University of Maryland
E-mail: gdellat@hotmail.com; gdellat@umd.edu

DESMOULINS, AUDE (France)
ZooParc de Beauval / EAZA Tapir TAG
E-mail: aude.desmoulins@zoobeauval.com

DINATA, YOAN (Indonesia)
Fauna & Flora International - Indonesia Program
E-mail: y1_dinata@yahoo.com

DOWNER, CRAIG C. (United States)
Andean Tapir Fund
E-mail: ccdowner@yahoo.com; ccdowner@terra.es

ESTRADA ANDINO, NEREYDA (Honduras)
E-mail: nerestr@yahoo.com; nereyda.estrada@gmail.com

FINNEGAN, MITCH (United States)
Oregon Zoo
E-mail: mitch.finnegan@oregonzoo.org

FLESHER, KEVIN (Brazil)
Michelin Brasil
E-mail: kevinmflesher@yahoo.com.br

FLOCKEN, JEFFREY (United States)
International Fund for Animal Welfare
E-mail: JFlocken@ifaw.org

FLÓREZ, FRANZ (Colombia)
Fundación Nativa
E-mail: tapirlanudo@hotmail.com; fkaston@nativa.org

FRAGOSO, JOSÉ MANUEL VIEIRA (United States)
Stanford University
E-mail: fragoso@stanford.edu

GARCÍA VETTORAZZI, MANOLO JOSÉ (Guatemala)
Universidad de San Carlos de Guatemala
E-mail: manelgato@gmail.com

GARRELLE, DELLA (United States)
Cheyenne Mountain Zoo
E-mail: dgarelle@cmzoo.org

GATTI, ANDRESSA (Brazil)
Universidade Federal do Espírito Santo (UFES)
E-mail: gatti.andressa@gmail.com

GLATSTON, ANGELA (The Netherlands)
Rotterdam Zoo
E-mail: a.glatston@rotterdamzoo.nl; aglatston@gmail.com

GOFF, DON (United States)
Beardsley Zoological Gardens / AZA Tapir TAG
E-mail: dgoff@beardsleyzoo.org

GONÇALVES DA SILVA, ANDERS (Australia)
CSIRO
E-mail: andersgs@gmail.com

GREENE, LEWIS (United States)
Columbus Zoo
E-mail: Lewis.Greene@columbuszoo.org

GUIRIS ANDRADE, DARIO MARCELINO (Mexico)
UN.A.CH., Policlinica y Diagnóstico Veterinario
E-mail: dmguiris@hotmail.com

HANDRUS, ELLIOT (United States)
E-mail: ebh12345@hotmail.com

HERNANDEZ DIVERS, SONIA (United States)
University of Georgia
E-mail: shernandez@warnell.uga.edu

HOLDEN, JEREMY (Indonesia)
Flora and Fauna International - Indonesia
E-mail: jeremy_holden1@yahoo.co.uk

HOLST, BENGT (Denmark)
Copenhagen Zoo / EAZA Tapir TAG / CBSG Europe
E-mail: beh@zoo.dk

JANSSEN, DONALD L. (United States)
San Diego Wild Animal Park
E-mail: djanssen@sandiegozoo.org

JULIÁ, JUAN PABLO (Argentina)
Reserva Experimental Horco Molle / Universidad National de Tucumán
E-mail: jupaju@yahoo.es

LEONARDO, RAQUEL (Guatemala)
Fundación Defensores de la Naturaleza
E-mail: raque.leonardo@gmail.com

LIRA TORRES, IVÁN (Mexico)
Dirección General de Zoológicos y Vida Silvestre de la Ciudad de México (DGZVSDF)
E-mail: ilira_12@hotmail.com

LIZCANO, DIEGO J. (Colombia)
Universidad de Pamplona
E-mail: dj.lizcano@gmail.com; dlizcano@unipamplona.edu.co

LUÍS, CRISTINA (Portugal)
Universidade de Lisboa
E-mail: cmluis@fc.ul.pt; cmluis@museus.ul.pt

LYNAM, ANTONY (Thailand)
Wildlife Conservation Society - Asia Program
E-mail: tlynam@wcs.org

MANGINI, PAULO ROGERIO (Brazil)
IPÊ - Instituto de Pesquisas Ecológicas (Institute for Ecological Research)
E-mail: pmangini@uol.com.br; pmangini@ipe.org.br

MARINEROS, LEONEL (Honduras)
IRBIO Zamorano
E-mail: lmarineros@gmail.com

MARTYR, DEBORAH (Indonesia)
Flora and Fauna International - Indonesia
E-mail: ffitigers@telkom.net

MATOLA, SHARON (Belize)
Belize Zoo and Tropical Education Center
E-mail: matola@belizezoo.org

MAY JR, JOARES A. (Brazil)
University of São Paulo (USP)
E-mail: joaresmay@ig.com.br

MEDICI, PATRÍCIA (Brazil)
IPÊ - Instituto de Pesquisas Ecológicas (Institute for Ecological Research)
E-mail: epmedici@uol.com.br

MENDOZA, ALBERTO (United States)
AZA Tapir TAG
E-mail: alumen@aol.com

MONTENEGRO, OLGA LUCIA (Colombia)
Universidad Nacional de Colombia (UNAL)
E-mail: olmdco@yahoo.com; olmontenegrod@unal.edu.co

MORALES, MIGUEL A. (Paraguay / United States)
Conservation International (CI)
E-mail: mamorales@conservation.org

MUENCH, CARLOS (Mexico)
CIEco-Centro de Investigaciones en Ecosistemas, Universidad Nacional Autónoma de México
E-mail: muench@oikos.unam.mx; carloserik@yahoo.com

NARANJO PIÑERA, EDUARDO J. (Mexico)
El Colegio de la Frontera Sur (ECOSUR)
E-mail: enaranjo@ecosur.mx

NOGALES, FERNANDO (Ecuador)
Instituto Ecuatoriano de Propiedad Intelectual (IEPI)
E-mail: fbnogales@utpl.edu.ec; fernogales@yahoo.com

NOVARINO, WILSON (Indonesia)
Universitas Andalas
E-mail: wilson_n_id@yahoo.com

NUGROHO, AGUNG (Indonesia)
Bogor Agricultural Institute (IPB)
E-mail: Pithecellobium98@yahoo.com

O'FARRILL, GEORGINA XoXo (Mexico)
ECOSUR-Chetumal, Mexico
E-mail: elsa.ofarrill@mail.mcgill.ca; georgina.ofarrill@mail.mcgill.ca

OLOCCO, MARIA JULIETA (Argentina)
Universidad de Buenos Aires
E-mail: mjoloccodiz@yahoo.com.ar

ORDÓÑEZ DELGADO, LEONARDO (Ecuador)
Fundación Ecológica Arcoiris
E-mail: tsg.ecuador@gmail.com; leonardo@arcoiris.org.ec

PAVIOLO, AGUSTÍN (Argentina)
Centro de Investigaciones del Bosque Atlántico-CONICET
E-mail: paviolo4@arnet.com.ar

PEDRAZA PEÑALOSA, CARLOS ALBERTO (Colombia)
Instituto de Investigación de Recursos Biológicos "Alexander von Humboldt"
E-mail: cpedraz@gmail.com

PERERA, LUCY (Venezuela)
Wildlife Conservation Society (WCS) – Venezuela
E-mail: lperera@wcs.org; lucy.perera@gmail.com

POÓT, CELSO (Belize)
Belize Zoo and Tropical Education Center
E-mail: celso@belizezoo.org

PRASTITI, SHARMY (Indonesia)
Taman Safari Indonesia / International Studbook Keeper, Malayan Tapirs
E-mail: tamansafari@indo.net.id; amicurator@tamansafari.com

PUKAZHENTHI, BUDHAN (United States)
Smithsonian National Zoological Park
E-mail: pukazhenthib@si.edu

QUSE, VIVIANA BEATRIZ (Argentina)
E-mail: vivianaquse@gmail.com

RESTREPO, HECTOR FRANCISCO (Colombia)
Fundación Wii
E-mail: restrepof@gmail.com

RICHARD-HANSEN, CECILE (French Guiana)
Office National de la Chasse et de la Faune Sauvage - ONCFS / Direction Etudes et Recherches
E-mail: Cecile.Richard-Hansen@ecofog.gf

RODRÍGUEZ ORTIZ, JULIANA (Colombia)
Instituto de Ciencias Naturales, Universidad Nacional de Colombia (UNAL)
E-mail: mjuli2@gmail.com; jrodriguezo@unal.edu.co

ROMAN, JOSEPH (United States)
Virginia Zoological Park / AZA Tapir TAG
E-mail: Joseph.Roman@norfolk.gov

RUBIANO, ASTRITH (United States)
Norbeck Animal Clinic
E-mail: astrithrubiano@yahoo.com; aty@norbeckanimalclinic.com

RUIZ FUAMAGALLI, JOSÉ ROBERTO (Guatemala)
Universidad de San Carlos de Guatemala
E-mail: rruizf@yahoo.com

RUSSO, KELLY J. (United States)
Houston Zoo Inc
E-mail: krusso@houstonzoo.org

SANCHES, ALEXANDRA (Brazil)
UNESP Rio Claro
E-mail: lelesanches@gmail.com

SANCHEZ, CARLOS (United States)
Smithsonian National Zoological Park
E-mail: sanchezca@si.edu

SANDOVAL ARENAS, SERGIO (Colombia)
Tapir Preservation Fund (TPF)
E-mail: tpflatin@gmail.com

SANDOVAL CAÑAS, LUIS FERNANDO (Ecuador)
E-mail: luissandoval79@gmail.com

SARMIENTO DUEÑAS, ADRIANA MERCEDES (Colombia)
Universidad Nacional de Colombia (UNAL)
E-mail: adrianasarmi@hotmail.com

SCHWARTZ, KARIN (United States)
Chicago Zoological Society - Brookfield Zoo
E-mail: karin.schwartz@czs.org

SCHWARTZ, RICHARD (United States)
Nashville Zoo at Grassmere
E-mail: rschwartz@nashvillezoo.org

SEITZ, STEFAN (Germany)
E-mail: tapirseitz@web.de

SHEWMAN, HELEN (United States)
Woodland Park Zoo
E-mail: helen.shewman@zoo.org

SHOEMAKER, ALAN H. (United States)
AZA Tapir TAG
E-mail: sshoe@mindspring.com

SHWE, NAY MYO (Myanmar)
Nature and Wildlife Conservation Division, Forest Department
E-mail: nmshwe@googlemail.com

SIMPSON, BOYD (Malaysia)
Malayan Tapir Project, Krau Wildlife Reserve, Copenhagen Zoo
E-mail: boydsimpson@gmail.com

SMITH, DIORENE (Republic of Panama)
Parque Municipal Summit
E-mail: dsmithc@gmail.com

STAHL, TIM (United States)
Stahl Photographics
E-mail: tim11@cox.net

STANCER, MICHELE (United States)
San Diego Zoological Society / AZA Tapir TAG
E-mail: mstancer@sandiegozoo.org

SUÁREZ MEJÍA, JAIME ANDRÉS (Colombia)
Programa KFW Belen de Umbria
E-mail: suarmatta@yahoo.com; jsuarezmejia@gmail.com

TAPIA, ANDRÉS (Ecuador)
Centro Tecnológico de Recursos Amazónicos de la Organización de Pueblos Indígenas de Pastaza
E-mail: sachacristo@gmail.com; centrofatima@andinanet.net

TOBLER, MATHIAS (French Guiana)
E-mail: matobler@gmx.net

TODD, SHERYL (United States)
Tapir Preservation Fund (TPF)
E-mail: tapir@tapirback.com; oregontapir@yahoo.com

TORRES, NATALIA (Ecuador)
Departamento de Educación, Zoológico de Quito
E-mail: ntorres@quitozoo.org; naty175@yahoo.com

TRAEHOLT, CARL (Malaysia)
Malayan Tapir Project, Krau Wildlife Reserve, Copenhagen Zoo
E-mail: ctraeholt@pd.jaring.my

UNDERDOWN, POLLY (United Kingdom)
E-mail: pollyunderdown@yahoo.co.uk; pollyunderdown@gmail.com

VARELA, DIEGO (Argentina)
Conservación Argentina
E-mail: dvarela@conservacion.org.ar

WALLACE, ROBERT B. (Bolivia)
Wildlife Conservation Society (WCS) - Madidi
E-mail: rwallace@wcs.org

WILLIAMS, KEITH (Australia)
E-mail: kdwilliams56@yahoo.co.uk

WOHLERS, HUMBERTO (Belize)
Belize Zoo
E-mail: animalmgt@belizezoo.org; humbertowohlers@yahoo.com

ZAINUDDIN, ZAINAL ZAHARI (Malaysia)
Malaysian Department of Wildlife and National Parks (DWNP)
E-mail: zainal@wildlife.gov.my

ZAVADA, JEANNE (United States)
East Tennessee State University Natural History Museum
E-mail: zavada@etsu.edu

ZAVADA, MICHAEL (United States)
Department of Biological Sciences, East Tennessee State University
E-mail: zavadam@etsu.edu

Illustrations by Stephen Nash

INSTRUCTIONS FOR AUTHORS

Scope

The Tapir Conservation, the Newsletter of the IUCN/SSC Tapir Specialist Group 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. Manuscripts should be submitted in MS Word (.doc, at this moment we cannot accept documents in .docx format).

The Newsletter will publish original work by:

- Scientists, wildlife biologists, park managers and other contributors on any aspect of tapir natural history including distribution, ecology, evolution, genetics, habitat, husbandry, management, policy and taxonomy.

Preference is given to material that has the potential to improve conservation management and enhances understanding of tapir conservation in its respective range countries.
The primary languages of the Newsletter are English and Spanish. Abstracts in English are preferred.

Papers and Short Communications

Full Papers (2,000-5,000 words) and Short Communications (200-2,000 words) are invited on topics relevant to the Newsletter's focus, including:

- Research on the status, ecology or behaviour of tapirs.
- Research on the status or ecology of tapir habitats, including soil composition, mineral deposits (e.g., salt licks) and topography.
- Husbandry and captive management.
- Veterinarian and genetic aspects.
- Reviews of conservation plans, policy and legislation.
- Conservation management plans for species, habitats or areas.
- Tapirs and local communities (e.g., hunting, bush meat and cultural aspects).
- Research on the ecological role of tapir, for example, seed dispersers, prey for predators and facilitators of forest regrowth.
- Natural history and taxonomy of tapirs (e.g., evolution, palaeontology and extinction).

How to Submit a Manuscript
Manuscripts should be submitted in ***electronic format*** by e-mail to the contributions editor at the email provided. Hard copies will not be accepted.
Contributions Editor:
Carl Traeholt
e-mail: ctraeholt@pd.jaring.my

In the covering e-mail, the Lead Author must confirm that:

a) the submitted manuscript has not been published elsewhere,

b) all of the authors have read the submitted manuscript and agreed to its submission,
all research was conducted with the necessary approval and permit from the appropriate authorities and adhere to appropriate animal manipulation guides.

Review and Editing

All contributors are strongly advised to ensure that their spelling and grammar is checked by native English or Spanish speaker(s) before the manuscript is submitted to the Contributions Editor. The Editorial Team reserves the right to reject manuscripts that are poorly written.

All manuscripts will be subject to peer review by a minimum of two reviewers. Authors are welcome to suggest appropriate reviewers; however, the Contributions Editor reserves the right to appoint reviewers that seem appropriate and competent for the task.

Proofs will be sent to authors as a portable document format (PDF) file attached to an e-mail note. Corrected proofs should be returned to the Editor within 3 days of receipt. Minor corrections can be communicated by e-mail.

The Editorial Team welcomes contributions to the other sections of the Newsletter:

News
Concise reports (<300 words) on news of general interest to tapir research and conservation. This may include announcements of new initiatives; for example, the launch of new projects, conferences, funding opportunities, new relevant publications and discoveries.

Letters to the Editor
Informative contributions (<650 words) in response to material published in the Newsletter.

Preparation of Manuscripts

Contributions in English should make use of UK English spelling [if in doubt, Microsoft Word and similar software can be set to check spelling and grammar for "English (UK)" language]. The cover page should contain the title and full mailing address, e-mail address and address of the Lead Author and all additional authors. All pages should be numbered consecutively, and the order of the sections of the manuscript should be: cover page, main text, acknowledgement, tables, figures and plates.

Title
This should be a succinct description of the work, in no more than 20 words.

Abstract
Full Papers only. This should describe, in 100-200 words, the aims, methods, major findings and conclusions. It should be informative and

INSTRUCTIONS FOR AUTHORS

intelligible without reference to the text, and should not contain any references or undefined abbreviations.

Keywords
Up to five pertinent words, in alphabetical order.

Format
For ease of layout, please submit all manuscripts with a minimum of formatting (e.g. avoid specific formats for headings etc); however, the following is needed:

- Manuscripts should be double-spaced.
- Submissions can be in 'doc, 'rtf' or 'wpd' format, preferably as one file attached to one covering email.
- **Avoid** writing headlines in CAPITAL letters.
- Font type and size should be Times New Roman # 12
- Font type for tables should be Arial and 0.5 dot lines.
- 1 inch (2.54 cm) margins for all margins
- Number pages consecutively starting with the title page , numbers should be on the bottom right hand corner
- Font type for tables should be Arial and 0.5 dot lines.
- Pictures and illustrations should be in as high resolution as possible to allow for proper downscaling and submitted as separate files in EPS or JPG format.

References
References should be cited in the text as, for example, MacArthur & Wilson (1967) or (Foerster, 1998). For three or more authors use the first author's surname followed by *et al.*; for example, Herrera *et al.* (1999). Multiple references should be in *chronological order*. The reference list should be in *alphabetical order*, and article titles and the titles of serial publications should be given in full. In cases where an author is referenced multiple times the most recent publication should be listed first. Please check that all listed references are used in the text and vice versa. The following are examples of house style:

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. Tropicale 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
MacArthur, R.H. & Wilson, E.O. (1967) *The Theory of Island Biogeography*. Princeton University Press, Princeton, USA.

Thesis/Dissertation
Foerster. C.R. 1998. Ambito de Hogar, Patron de Movimentso 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.

Web
IUCN (2007) *2007 IUCN Red List of Threatened Species*. Http://www.redlist.org [accessed 1 May 2009].

Tables, figures and plates
These should be self-explanatory, each on a separate page and with an appropriate caption. Figures should be in black and white. Plates will only be included in an article if they form part of evidence that is integral to the subject studied (e.g., a camera-trap photograph of a rare situation), if they are of good quality, and if they do not need to be printed in colour.

Species names
The first time a species is mentioned, its scientific name should follow without intervening punctuation: e.g., Malay tapir *Tapirus indicus*. English names should be in lower case throughout except where they incorporate a proper name (e.g., Asian elephant, Malay tapir).

Abbreviations
Full expansion should be given at first mention in the text.

Units of measurement
Use metric units only for measurements of area, mass, height, distance etc.

Copyright
The copyright for all published articles will be held by the publisher unless otherwise stated.

Publisher
IUCN Tapir Specialist Group

Website
www.tapirs.org

TAPIR SPECIALIST GROUP STRUCTURE

Chair
Patrícia Medici, Brazil

Steering Committee
Alan Shoemaker, United States
Alberto Mendoza, Mexico/United States
Anders Gonçalves da Silva, Canada
Bengt Holst, Denmark
Carl Traeholt, Denmark/Malaysia
Diego Lizcano, Colombia
Gilia Angell, United States
Jeffrey Flocken, United States
Kelly Russo, United States
Mathias Tobler, Switzerland/Peru
Michael Dee, United States
Michele Stancer, United States
Olga Montenegro, Colombia
Rick Schwartz, United States
Viviana Quse, Argentina

Baird's Tapir Coordinator
Manolo García, Guatemala

Lowland Tapir Coordinator
Viviana Beatriz Quse, Argentina

Malayan Tapir Coordinator
Carl Traeholt, Denmark/Malaysia

Mountain Tapir Coordinator
Diego J. Lizcano, Colombia

Red List Authority
Red List Focal Point: Alan H. Shoemaker, United States
TSG Species Coordinators / TSG Country Coordinators

Tapir Conservation Newsletter Editors
Contributions Editor: Carl Traeholt, Malaysia
Layout & Distribution Editors:
Stefan Seitz, Germany / Kelly J. Russo, United States

Virtual Library Manager
Mathias Tobler, United States/Peru

Fundraising Committee Coordinator
Patrícia Medici, Brazil

Action Planning Committee Coordinator (National Action Plans)
Patrícia Medici, Brazil / TSG Country Coordinators

Action Plan Implementation Taskforce
Coordinator: Patrícia Medici, Brazil
Focal Point(s) Lowland Tapir: Olga Montenegro, Juliana Rodriguez, Benoit de Thoisy
Focal Point(s) Baird's Tapir: Kendra Bauer
Focal Point(s) Mountain Tapir: Carlos Pedraza
Focal Point(s) Malayan Tapir:
Carl Traeholt, Zainal Zahari Zainuddin
Focal Point(s) Ex-Situ Conservation:
Viviana Quse (Lowland Tapir), Nanda Kumaren (Malayan Tapir), Alberto Mendoza (Baird's Tapir)
Focal Point(s) Marketing & Education: Kelly Russo

Zoo Committee Coordinator
Viviana Beatriz Quse, Argentina

Veterinary Committee Coordinator
Javier Adolfo Sarria Perea, Colombia/Brazil

Genetics Committee Coordinators
Anders Gonçalves da Silva, Australia

Marketing & Education Committee Coordinators
Gilia Angell, United States / Kelly J. Russo, United States

Webmasters
Kara Masharani, United States
Gilia Angell, United States

Re-Introduction & Translocation Advisory Committee Coordinators
Patrícia Medici, Brazil / Anders Gonçalves da Silva, Canada

Ethics Committee

Evolution Consultant
Matthew Colbert, United States

Country Coordinators
South America
Argentina: Silvia Chalukian
Bolivia: Guido Ayala
Brazil: Patrícia Medici
Colombia: Olga Montenegro, Juliana Rodríguez
Ecuador: Leonardo Ordóñez Delgado, Fernando Nogales
Guiana Shield (French Guiana, Guiana and Suriname): Benoit de Thoisy
Paraguay: José Luis Cartes
Peru: Mathias Tobler
Venezuela: in the process of identifying a coordinator
Central America
Belize: in the process of identifying a coordinator
Costa Rica: in the process of identifying a coordinator
Guatemala: José Roberto Ruiz Fuamagalli
Honduras: Nereyda Estrada Andino
Mexico: Epigmenio Cruz Aldán
Nicaragua: in the process of identifying a coordinator
Panama: in the process of identifying a coordinator
Southeast Asia
Indonesia: Wilson Novarino
Malaysia: Zainal Zahari Zainuddin
Myanmar: Antony Lynam

Tapir Conservation

The Newsletter of the IUCN/SSC Tapir Specialist Group

Volume 19/1 ■ No. 26 ■ **June 2010**

Contents

HOUSTON ZOO NATURALLY WILD

1513 North MacGregor
Houston, Texas 77030
www.houstonzoo.org

Address Service Requested