

**8TH INTERNATIONAL TAPIR SYMPOSIUM**

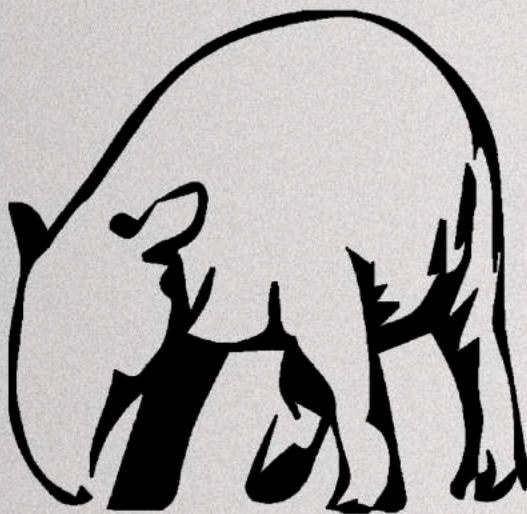
# **BOOK OF ABSTRACTS**

Novotel, Campo Grande,  
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**ORGANIZERS:**

IUCN SSC Tapir Specialist Group (TSG)  
Instituto de Pesquisas Ecológicas (IPÊ), Brazil



# KEYNOTE SPEAKERS

## EDUARDO NARANJO

El Colegio de la Frontera Sur (ECOSUR) – Mexico

### THE EFFECTS OF HUNTING ON TAPIR POPULATIONS

Historically, tapirs have been used by subsistence hunters as sources of meat and hides. Deliberate hunting of tapirs for subsistence, sport, trade, or retaliation from crop damage is not widespread but persists in many range countries. We discuss the effects of hunting, the relevant biological traits, and the potential of tapir (*Tapirus spp.*) populations to be harvested sustainably through different alternatives. The impact of hunting on tapirs is often linked to habitat degradation and other types of human activity. The combined effects can result in lower densities and occupancy rates, less diurnal activity, and local extinctions in fragmented landscapes, a trend that continues throughout most range countries, especially outside protected areas. In addition to harvest rates, population density and reproductive capacity are essential variables to be considered for assessing sustainable hunting. Sustainable hunting has proven an important conservation tool for many fast-reproducing wildlife populations, but considering tapirs' low densities and modest reproductive capacity, it is likely not suitable for these ungulates. Optimistic annual harvest rates estimated through different models were just 1 tapir every 14, 50, 167, and 12 km<sup>2</sup> for *T. bairdii*, *T. indicus*, *T. pinchaque*, and *T. terrestris*, respectively. Except for *T. terrestris* in some parts of the Amazon Basin, it is difficult to find extensive areas of suitable habitat to support sustainable harvests of tapirs. Promoting ecotourism (tapir watching), captive breeding for display in zoos, and potential reintroductions are alternatives for tapir sustainable use other than hunting.

## **PATRÍCIA MEDICI**

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Chair, IUCN SSC Tapir Specialist Group (TSG)

TED Fellow & National Geographic Explorer

### **IN SEARCH OF THE LOST TAPIRS OF THE CAATINGA**

Biological knowledge alone is not enough to solve conservation problems. Views of scientists and local communities about biodiversity and nature should be integrated for successful conservation. Communities interacting closely with nature have a profound ecological understanding and can provide critical information about the presence and historical distribution of threatened species, as locals may share the memories of their predecessors as well as their own. We relied on traditional and local ecological knowledge to recover information about lowland tapirs in the Caatinga biome, Brazil, as well as to understand local views on biodiversity and nature. Tapirs have been listed as Regionally Extinct in the Caatinga based on extremely limited information, and research was needed to confirm or refute this preliminary classification. In March 2023, we performed 90 face-to-face interviews using the snowball sampling method in local communities across Minas Gerais, Piauí and Bahia states. Interviewees were 70 years old on average and mostly born and raised in the region (78%). Additionally, we met with managers from 12 protected areas, and explored gray literature. We registered 38 historical records dating up to 400 years ago, which include some innermost Caatinga locations, but all current records (53) are located in ecotones. Interviewees reported poaching, deforestation, fires, limitation of water resources and agribusiness as the main causes for tapir disappearance. Current threats to local wildlife included habitat loss, poaching, roads, fires, degradation of water bodies, droughts and agribusiness. Interviewees reported that government assistance programs have decreased dependence on subsistence poaching. Nevertheless, increasingly frequent droughts are leading to food insecurity and threatening their livelihood. This study highlights not only the importance of people-centered conservation, but also the usefulness of data provided by local communities for the development and implementation of conservation strategies, better informing National and Global lists of threatened species and action plans.

**CLÁUDIO ÂNGELO**

Communication Coordinator, Observatório do Clima, Brazil

**TAPIRS, TICKING CLOCKS AND TIPPING POINTS: CONSERVATION IN TIMES  
OF RUNAWAY CLIMATE CHANGE**



# POSTER SESSIONS

## **P-01 First report of natural infection by *Trypanosoma terrestris* in *Tapirus terrestris* (Perissodactyla: Tapiridae) in the Brazilian Amazon**

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The tapirs are large terrestrial mammals, anatomically and physiologically adapted to almost all habitats and ecosystems. Despite its importance in seed dispersal, preservation and reconstruction of habitats, information on infectious agents that affect these animals is still incipient. The objective of this study was to detect natural *Trypanosoma terrestris* infection in captive tapirs (*Tapirus terrestris*) in the Brazilian Amazon. Samples were collected from tapirs chemically restrained in Zoo-botanical Parks, breeding facilities, conservationists and environmental compensation areas in the states of Amapá, Amazonas and Pará. Peripheral blood smears were prepared for microscopic investigation of trypomastigotes forms, while whole-blood samples were used for blood culture and molecular analysis. *Trypanosoma sp.* was isolated in blood culture from one Brazilian tapir (4%; 1/25). The analysis of blood smears no revealed the presence of trypomastigotes forms, but DNA from *Trypanosoma spp.* was detected in 24% (6/25) of the animals. Sequencing confirmed the results obtained by PCR and phylogenetic analysis revealed the identity of *Trypanosoma terrestris* isolates from a Brazilian tapir with other sequences of this trypanosomatid available in GenBank. In conclusion, the present study reports of natural *Trypanosoma terrestris* infections in tapirs in the Brazilian Amazon for the first time.

## **P-02 Natural *Mycoplasma spp.* infection in captive and free-living *Tapirus terrestris* (Perissodactyla: Tapiridae) in the Brazilian Amazon**

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Hemotropic species of the genus *Mycoplasma* are small pleomorphic bacteria that adhere to the surface of erythrocytes from different species of domestic animals, and wild animals, including tapirs. Infections with these agents are reported on all continents except Antarctica, and can cause infectious anemia in susceptible hosts. In this context, the objective of this study was to detect natural hemotropic *Mycoplasma spp.* infection in captive and free-living tapirs (*Tapirus terrestris*) in the Brazilian Amazon. Whole-blood samples were collected, and peripheral blood smears were prepared from tapirs chemically restrained in Zoo-botanical Parks, breeding facilities conservationists and environmental compensation areas in the Amapá, Amazonas and, Pará states. Additionally, whole-blood samples were collected from free-living tapirs captured in the Mato Grosso and Pará states. These biological samples were subjected to microscopic and/or molecular analyzes for subsequent screening of *Mycoplasma spp.* DNA by PCR using the HBT-F and HBT-R primer set. Microscopic analyses of blood smears revealed epi-erythrocytic forms in 8% (2/26) of the captive animals. *Mycoplasma spp.* DNA was detected in 46% (12/26) and 94% (16/17) of the samples of captive and free-living tapirs, respectively. In conclusion, *Mycoplasma spp.* infection occurs in captive and free-living tapirs in the Brazilian Amazon, and the present study reports natural hemotropic *Mycoplasma* species infections in *T. terrestris* in the Brazilian Amazon for the first time.

### **P-03 Tick and flea infestations in captive *Tapirus terrestris* (Perissodactyla: Tapiridae) in the Oriental Amazon, Brazil**

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Ticks and fleas are diverse groups of arthropods which infest humans and different domestic, synanthropic and wild hosts. Approximately 980 species of ticks and 3000 species/subspecies of fleas have been described thus far, and these ectoparasites are widely distributed across all continents. Tapirs (Perissodactyla: Tapiridae) are the largest land mammals native to South America. They help preserve and/or recover habitats through seed dispersal and have also suffered from anthropic pressure and habitat loss. In Brazil, *Tapirus terrestris* is widespread and inhabits all biomes (Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal and, Pampa). Despite their ecological importance, studies on the ectoparasites that affect these mammals remain incipient, especially in the Amazon biome. Therefore, the present study aimed to identify tick and flea species infesting captive tapirs (*T. terrestris*) in the Oriental Amazon, Brazil. Ectoparasites were collected from tapirs chemically restrained in Zoo-botanical Parks and breeding facilities conservationists in the states of Amapá and Pará. After collection, the tick and flea specimens were placed in plastic pots containing isopropanol and identified according to dichotomous keys. Ectoparasite infestations were observed in 71% (17/24) tapirs, of which 59% (10/17) were single infestations with ticks or fleas, and 41% (7/17) were mixed infestations with different species of ticks and/or fleas. In total, 180 ticks (13 larvae, 103 nymphs, 27 females and 37 males) and 14 fleas (eight females and six males) were collected, identifying four tick species (*Amblyomma cajennense sensu stricto*, *Amblyomma naponense*, *Amblyomma oblongoguttatum*, and *Amblyomma pacae*) and three flea species and/or subspecies (*Ctenocephalides felis felis*, *Rhopalopsyllus australis australis*, and *Tunga penetrans*). In conclusion, infestations with Ixodidae ticks and Rhopalopsyllidae, Pulicidae and Tungidae fleas were found in captive tapirs in the Oriental Amazon, and *A. cajennense* s.s. was the most frequent species. Additionally, the present study reports new associations between *A. pacae* and *R. a. australis* with *T. terrestris*.

## **P-04 Occurrence of Anti-*Toxoplasma gondii* and Anti-*Neospora caninum* Antibodies in Lowland Tapirs (*Tapirus terrestris*) from Brazil**

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The lowland tapir (*Tapirus terrestris*) is a perissodactyl from the Tapiridae family, which occurs in open areas or forests close to watercourses. It is the largest land mammal in Brazil and plays an important role in seed dispersal. Its natural predators are large felines, such as the jaguar and the cougar, as well as humans. Toxoplasmosis is a zoonosis caused by the protozoan *Toxoplasma gondii*, which is of great importance in public health due to its high prevalence and ability to infect several species of homeothermic vertebrates, including humans. *Neospora caninum* is an obligatory intracellular protozoan belonging to the phylum Apicomplexa, which causes neosporosis, a disease of greatest importance in cattle due to the occurrence of repetitive abortions. The objective of the present study was to determine the occurrence of anti-*T. gondii* and anti-*N. caninum* in lowland tapirs from the Amazon (AM), Atlantic Forest (AF), Cerrado (CE), and Pantanal (PA) biomes, Brazil. The study was conducted in different locations representing these Brazilian biomes, including Morro do Diabo State Park, located in the municipality of Teodoro Sampaio, state of São Paulo (AF); a private cattle-ranch in the Pantanal, municipality of Aquidauana, Mato Grosso do Sul (PA); the municipalities of Nova Alvorada do Sul and Nova Andradina, also in Mato Grosso do Sul (CE); and, two sites in the southern arc of deforestation in the Amazon (AM) – Carajás National Forest, municipality of Parauapebas, Pará state, and Tanguro Farm, municipality of Querência, Mato Grosso state. Blood samples were collected from 2006-2023 through venipuncture (jugular, cephalic or saphenous vein), and were subsequently processed. The serum obtained was stored at -20°C. For the detection of IgG anti-*T. gondii*, the Modified Agglutination Test (MAT<sub>≥25</sub>) was used. The detection of anti-*N. caninum* was performed using the Indirect Immunofluorescence Reaction (IFAT), with a cutoff point of 1:50. All positive samples were serially diluted in base two, until the maximum positive titer. Samples were obtained from a total of 118 tapirs, including 16 from the AM, 26 from the CE, 13 from the AF, and 63 from the PA. Of the total number of individuals analyzed, 22 (18.64%) were positive for *T. gondii* and

presented antibody titers ranging from 25 to 400 (Table 1). From the AF biome, 11 (8.46%) of the tapirs were positive, followed by the CE with seven (26.92%) and PA with four (6.34%) positive animals. All individuals from the AM were negative for *T. gondii*. For *N. caninum*, 10 (8.47%) tapirs were positive, nine (14.28%) from the PA and one (3.84%) from the CE, with antibody titers ranging from 50 to 400. The tapirs from the AM and AF biomes were all negative for *N. caninum*. The occurrence of anti-*T. gondii* and anti-*N. caninum* was low in individuals sampled from the different biomes studied. This was the first research carried out concerning these pathogenic agents in lowland tapirs in Brazil, using anti-Tapir IgG conjugate (specific secondary antibody for this specie).

### **P-05 Lowland tapir microbiota in the Amazon biome: Composition and occurrence of microorganisms in different cavities**

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The microbiota plays a pivotal role in the health of diverse organisms, impacting various physiological processes and protecting against pathogenic invaders. In mammalian hosts, the microbiota exhibits significant variance across the anatomical cavities, modulated by different factors including the environment, dietary patterns and social interactions. This study aims to elucidate the bacterial composition within different anatomical cavities of lowland tapirs (*Tapirus terrestris*): palpebral, nasal, oral, auricular, rectal, vaginal, preputial and urethra regions. It highlights the most isolated bacteria and compares the distribution of Gram-positive and Gram-negative bacteria. Sterile swab samples were carefully collected from 27 lowland tapirs inhabiting two different areas of the Amazon, both located in the southern arc of deforestation with highly fragmented forest areas, resulting in a comprehensive dataset of 121 samples. The study sites were: Carajás National Forest, municipality of Parauapebas, Pará state, which includes the world's largest open-pit iron ore mine; and Tanguro Farm, municipality of Querência, Mato Grosso state, a large-scale monoculture farm (soybeans, cotton, corn). The samples were stored in Stuart transport medium and stored refrigerated (5°C) for 3-15 days until processing in a clinical laboratory. The bacteria were identified based on biochemical tests, according to previously described key charts. Analyses included the most isolated bacteria and the frequency of occurrence of different bacteria in each region. Among Gram-positive bacteria, *Staphylococcus aureus* was the most frequent, occurring in 15.3% of samples, succeeded by *Enterococcus faecalis* (9.8%) and *Streptococcus intermedius* (7.5%). Among Gram-negative bacteria, *Pantoea (Enterobacter) agglomerans* was the predominant species, evident in 12.6% of samples, followed

by *Escherichia coli* (10.9%) and *Pseudomonas aeruginosa* (8.3%). When detailing the results by cavity, the predominant presence of *Pantoea (Enterobacter) agglomerans* was in the oral (36,84%) and eyelid (21,74%) cavities, alongside notable occurrence of *Klebsiella pneumoniae* (21.05%) and *Pseudomonas aeruginosa* (15.79%) within the oral mucosa. In the nasal cavity, *Pantoea (Enterobacter) agglomerans* similarly prevailed (21,74%), followed by *Escherichia coli* (13,04%) and *Staphylococcus aureus* (4,35%). In the ear canal samples, *Staphylococcus aureus* was most frequent bacteria (30,77%), followed by *Pseudomonas aeruginosa* (26,92%) and *Staphylococcus intermedius* (23,08%). Rectal swabs demonstrated a preponderance of *Escherichia coli* (30,77%), followed by *Pseudomonas aeruginosa* (23,08%) and *Enterobacter cloacae* (15,38%). The same pattern was observed in vaginal samples, as *Staphylococcus aureus* predominated (28,57%). The preputial region exhibited notable *Pantoea (Enterobacter) agglomerans* (33,33%), followed by *Staphylococcus aureus* (22,22%) and *Serratia marcescens* (22,22%). Urethral swabs displayed significant presence of both *Staphylococcus aureus* (18.18%), and *Pantoea (Enterobacter) agglomerans* (18.18%). Regarding swabs from lesions, *Streptococcus agalactiae* (Group B) and *Staphylococcus aureus* were detected in all samples, while *Streptococcus porcinus* was the only microorganism detected in an oral abscess. The diversity of Gram-positive and Gram-negative bacteria observed reflects the complexity of the microbiota in these species. The analyses confirmed significant differences in the occurrence of certain microorganisms between the sampled regions, indicating a heterogeneous distribution of the microbiota throughout the tapir body, revealing significant diversity. These findings underscore the importance of accounting for microbiota diversity in addressing health and conservation issues pertinent to lowland tapirs.

## **P-06 The first molecular characterization of the protozoan *Balantioides coli* in Brazilian Tapirs: Preliminary results**

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Over the last centuries, wildlife species have been decreasing, with the extinction of different populations. The lowland tapir was extinct in the state of Rio de Janeiro, Brazil, in 1914 and reintroduced in 2017. Among the different causes of wildlife reduction, infections by gastrointestinal parasites stand

out. Although the topic is very relevant to lowland tapir, there is still a lack of information about the parasites that can infect them. Typically, the available information consists of sporadic reports, often mentioning protists from the Ciliophora group without providing deeper identification of the parasitic taxa. Based on the above, this study aimed to describe gastrointestinal parasites in tapir feces with an emphasis on ciliated protozoa. Between March 2023 and April 2024, 29 fecal samples were collected from tapirs kept under human care. Of these, 15 were obtained from different institutions located in Rio de Janeiro: three of which were collected from zoos/shelter facilities and 12 from tapirs kept in acclimatization pens in a Protected Area. The others 14 samples were obtained from zoo/shelter facilities located in São Paulo state. The samples were obtained directly from the floor of the enclosures to promote animal welfare and avoid unnecessary stress of containment. In the laboratory, feces were subjected to direct examination and gastrointestinal parasite research techniques of spontaneous sedimentation, centrifugal-sedimentation and centrifugal flotation. The samples that presented cysts and/or trophozoites from the Ciliophora Group were inoculated in modified Pavlova culture medium added with fetal serum and in medium added with equine serum. The isolates successfully maintained in vitro until the 5th day of incubation in modified Pavlova media were subjected to molecular analysis of the DNA fragment from the ITS1.5S.ITS2 region of ciliated protists. For those that were not isolated in vitro, molecular analysis was performed on DNA extracted directly from fecal material. In total, 62.1% of the samples were positive for gastrointestinal parasites, with the Ciliophora Group being the most identified (58.6%) in microscopic techniques. In addition to these, coccidia oocysts (20.6%), strongyle eggs (34.5%) and nematode larvae (27.5%) were also detected. Of the 17 samples positive for the Ciliophora Group, 10 were isolated in vitro. Of these, eight have already been molecularly analyzed, with all nucleotide sequences generated classified as *Balantioides coli*. Furthermore, nucleotide sequences from two fecal samples have also been analyzed and were identified as belonging to the same parasite. When classifying the genetic variants of this protist, six *B. coli* nucleotide sequences of type A0 and three as B0 can be verified, with both types identified in feces from tapirs under human care in Rio de Janeiro and São Paulo. It is worth noting that *B. coli* is a protozoan with broad zoonotic potential and the type A0 genetic variant has already been identified in humans. Furthermore, pigs and non-human primates are already considered the main reservoirs of this parasite. This study is pioneering, and these preliminary results indicate that the lowland tapir is also a host of *B. coli*, thus potentially serving as another reservoir of this pathogen.

## **P-07 Predictive models of habitat suitability for lowland tapir (*Tapirus terrestris*) in Misiones, Argentina**

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The Atlantic Forest comprises a mosaic of 15 ecoregions and is globally recognized as a biodiversity hotspot. In the last decades, it experienced profound habitat degradation and fragmentation, resulting in the loss of approximately 85% of its original extent due to anthropogenic land use changes. In Argentina, the province of Misiones holds one of the last strongholds of Upper Parana Atlantic Forest ecoregion, represented by 55-60% of its original cover. While larger forest fragments persist within protected areas, smaller remnants remain surrounded by altered landscapes, including monoculture plantations, small-scale agriculture, and grasslands. Within this intricate ecological landscape, the subpopulations of lowland tapir (*Tapirus terrestris*) face numerous threats, including habitat degradation and fragmentation, encroachment from livestock farming, poaching, urban sprawl, and vehicle collisions. The global and national conservation status of the tapir is currently listed as Vulnerable, while Misiones subpopulation is classified as Endangered. Furthermore, it holds the distinction of being declared a Provincial Natural Monument in four Argentinean provinces, including Misiones, granting it the highest level of legal protection. Understanding the habitat preferences and distributional patterns of keystone species, such as the tapir, is imperative for formulating effective conservation strategies. Here, we present a comprehensive spatial analysis of habitat suitability for tapirs in the heterogeneous landscape of Misiones, Argentina. Our sampling methodology employed conservation detection dogs trained to locate tapir scats, irrespective of habitat type, human detectability, protective status of the area, and proximity to human settlements. Over three surveys periods (2016, 2018, and 2022), a total of 1,269 km was covered, yielding 53 georeferenced records of tapir occurrences. These records encompassed tracks, as well as genetically confirmed scats identification. Our spatial analyses extended beyond individual georeferenced points to assess the prevalence of land cover types and anthropogenic alterations within the species' home range. Using MaxEnt modeling, these data were used to evaluate habitat suitability for tapir, yielding models with robust predictive power (average AUC =  $0.936 \pm 0.045$  over 15 subsample replicates). Notably, our analyses yielded nuanced spatial patterns of habitat suitability, underscoring the pivotal role of dense vegetative cover, landscape heterogeneity, and agricultural activities, as determinants of tapir habitat suitability. In summary, the integration of noninvasive sampling techniques, such as detection

dog surveys, genetic analyses of scats, and spatial modeling tools, provides a robust framework for assessing tapir habitat suitability and guiding targeted conservation interventions. These findings underscore the necessity of interdisciplinary approaches and innovative methodologies to deepen our understanding of species ecology and facilitate effective conservation management in complex landscapes.

## **P-08 Preliminary analysis of epididymal sperm morphometry of a male tapir (*Tapirus terrestris*)**

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The IUCN (International Union for Conservation of Nature) categorizes the Tapir (*Tapirus terrestris*) as Vulnerable, with a decreasing population trend. Among conservation efforts, reproductive studies play an important role. In this sense, the parameters of normality of seminal samples have not yet been defined, information that could be useful for germplasm preservation and artificial insemination programs. This work makes a contribution by evaluating the morphometry of the sperm of a Tapir individual of approximately 8 years old, kept in semi-captivity in the Reserva Experimental de Horco Molle, Tucumán, Argentina, who died of natural causes. For the study, the testes were obtained and the epididymis were immediately dissected and fixed in 10% formalin. Afterwards, epididymal spermatozoa were recovered by slicing. The suspension obtained was centrifuged at 600 x g for 4 minutes to eliminate the supernatant. The pellet was suspended in saline solution and smears were taken, dried and then stained with eosin/nigrosine. Images of the spermatozoa were obtained with an Axiovert A1 FL-LED inverted microscope (Carl Zeiss) and morphometry was calculated using Zen 3.9 Zeiss Lite Software, head area (HA) (n=112) and tail length (TL) were measured (n=67). The results, expressed as mean  $\pm$  SD, were HA  $14.27 \pm 1.6 \mu\text{m}^2$  and TL  $57.12 \pm 3.01 \mu\text{m}$ . The analysis of the HA frequency showed a high dispersion, been 91% of the measurements in a range of 11.71-16.58  $\mu\text{m}^2$ . Regarding the TL, 82% of measurements were grouped between 53.20-60.60  $\mu\text{m}$ . This preliminary study indicates a high variability in the sperm morphometry of the single male analyzed. More individuals are needed in order to define the morphometric pattern of this species.

## **P-09 Towards a tapir anatomy atlas: Describing, comparing, and illustrating tapirs**

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Descriptive and comparative anatomy serves as a cornerstone for understanding organismal biology. Equids often serve as convenient proxies for tapir anatomy (Mammalia: *Tapiridae*); however, they are not always applicable, even if closely related. Tapir anatomy is still poorly understood and sparsely researched, to fully understand tapir biology and health, a more thorough documentation of genus (or even species) level anatomy is required. Herein, we conducted a literature review on tapir anatomy and found mostly historical, non-updated sources with significant gaps in this field of research. To better comprehend tapir anatomy, we conducted multiple dissections of the hindlimb musculature of a Lowland tapir (*Tapirus terrestris*). Following this work, we constructed scientific illustrations by using Adobe programs integrated with 3D scans processed in ZBrush. Subsequently, we visualised representations of several evolutionary characteristics including tapir natural history and ancestry based in skull morphology. To further enhance our understanding of tapir anatomy, we conducted an in-depth anatomical investigation of the anatomy of the Baird's tapir (*Tapirus bairdii*) from a roadkill carcass in Costa Rica. From this dissection, we collected quantitative data on all organ systems, mapped aspects of the peripheral nervous system such as the Brachial plexus, and uncovered previously undocumented features awaiting functional elucidation. Through this comprehensive investigation we have initiated comparative analyses within genus and with related model species (horses and rhinoceroses), offering valuable insights for researching evolutionary shifts in organ systems. In future studies, we will look to expand our knowledge regarding the anatomical features of all tapir species. Our ultimate goal is to compile a meticulously illustrated, complete tapir atlas, where scientific illustrations will be the foundation to communicate tapir anatomy. This investigation will be of great scientific value across many disciplines, offering fundamental knowledge for clinical-surgical, management, conservation, and other research applications for the genus *Tapirus*.

## **P-10 Behavioral interaction between *Milvago chimachima* (Aves: Falconidae) and *Tapirus terrestris* (Mammalia: Tapiridae) in the middle basin of the Bitá River, Vichada-Colombia**

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It is difficult to scientifically document ecological relationships between animals of different taxonomic classes. We report a mutualistic interaction between a tick-tyrant (*Milvago chimachima*), a bird of prey widely distributed in Colombia, and a subadult lowland tapir (*Tapirus terrestris*), the largest terrestrial mammal of the native savannas of eastern Colombia. This behavioral interaction was documented on December 22, 2023 in one of the photo-trapping stations installed in the middle basin of the Bitá River (6°07'23.1 "N - 8°19'09.1 "W) department of Vichada. The camera trap recording obtained during the period of low rainfall began with the encounter between the two species at 7:24 am and ended at 8:16 am, with a duration of 51 minutes. During this time, the male lowland tapir lay down for the raptor to remove ectoparasites from its fur on the upper (n = 48), anterior (n = 27), posterior (n = 73) and lower (n = 152) parts of the body interacting a total of 300 times. Finally, the lowland tapir individual stands up and begins to walk, heading to a wooded area. Our record confirms a mutualistic relationship where the individual *T. terrestris* benefits from the removal of ectoparasites from its body and the bird of prey obtains food resources. Our results documented another strategy used by the lowland tapir to eliminate external parasites besides entering water sources.

## **P-11 Habitat suitability and representativeness of the potential distribution of the lowland tapir (*Tapirus terrestris*) in the savanna landscape and protected areas of the Colombian Orinoco Region**

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The lack of knowledge of the distribution patterns of wild ungulates hinders the implementation of effective strategies for the conservation of their populations in neotropical savannas. The Orinoquia is one of these ecoregions with limited information and is poorly represented in the National System of Protected Areas of Colombia. However, these ecosystems provide habitat for 70% of the ungulate species reported in Colombia. Our objective was to identify where the lowland tapir occurs and to evaluate the representativeness of the distribution in different cover types, especially within Protected Areas (PAs) in the department of Vichada. For

this, we first modeled the ecological niche of *Tapirus terrestris* using the MaxEnt algorithm. Subsequently, we classified the potential distribution into three zones of habitat suitability and evaluated how well represented the areas are within the current conservation system. The suitable area for *T. terrestris* was 134,575 km<sup>2</sup>, with the most representative savanna landscapes being: (i) savannas (118,125 km<sup>2</sup>, 87.8%) and (ii) evergreen forests (12,550 km<sup>2</sup>, 9.3%). Additionally, (2,925 km<sup>2</sup>, 2.2%) of the suitable area was reported within Civil Society Nature Reserves. Our results highlight the ecological importance of private conservation initiatives as a complementary strategy to state PAs, in addition to contributing to functional connectivity at a regional scale. We provide information on the spatial ecology of the lowland tapir as an input for conservation and territorial planning professionals in the eastern Colombian savanna.

## **P-12 Evaluation of habitat connectivity for three species of ungulates in native Altillanura Savannas, Vichada-Colombia**

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The native altillanura savanna landscape of the Orinoco River basin in Colombia is a hotspot of diversity for wild ungulates. In the last 20 years, the rapid transformation of natural covers has resulted in the loss of connectivity between habitats. Notwithstanding, the region lacks an analysis of biological connectivity based on a multi-species approach that incorporates groups of species that are representative of the savanna ecosystem, such as ungulates. Therefore, it is a vital to know the spatial distributions of suitable areas and main habitats that may play an essential role for wild ungulates in these landscapes. We used an occurrence dataset of *Tapirus terrestris*, *Odocoileus virginianus* and *Tayassu pecari* for the development of potential distribution models, binarization and analysis of spatial morphological patterns. This information was used for the modeling of dispersal corridors connecting essential habitats of ungulate focal species using the randomized shortest path algorithm and quantification of weighted global connectivity metrics. Our results suggest the existence of an integral corridor with potential least-cost dispersal routes between the native savannas of the middle and middle-lower basins of the Bitá - Tomo - Tuparro - Vichada rivers and, to a lesser extent, the lower basin of the Meta River. The spatial information generated on the focal species of ungulates could become an input that contributes to improve the management of metapopulations in the Orinoquia region.

## **P-13 Occurrence of infectious agents in lowland tapir populations in the Amazon: Preliminary findings and implications for conservation and public health**

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The Amazon region is renowned for its unique biodiversity, harboring a wide array of species. Large mammals play a crucial role in maintaining forest ecosystem health and the lowland tapir (*Tapirus terrestris*) is a well-known key species for the maintenance of biological diversity. Exposure to infectious agents poses a threat to these animals and, therefore, for the region's biodiversity. This study aimed to investigate the occurrence of infectious agents in two lowland tapir populations in the Amazon biome. Understanding infection patterns is crucial for assessing animal health and implementing effective control and conservation measures. Samples were collected from two different tapir populations in the Amazon, both located in the southern arc of deforestation with highly fragmented forest areas. The study sites were: Carajás National Forest, municipality of Parauapebas, Pará state, which includes the world's largest open-pit iron ore mine: and Tanguro Farm, municipality of Querência, Mato Grosso state, a large-scale monoculture farm (soybeans, cotton, corn). Thirty tapirs were captured using three different methods: darting from a distance, box-traps, and pitfall traps. Blood samples were collected through venipuncture of the cephalic or saphenous vein, processed and the serum stored at -21°C for serological analyses, employing specific ELISA techniques for detecting antibodies against infectious agents. Additionally, vaginal swabs were obtained for detecting porcine parvovirus DNA through the Polymerase Chain Reaction (PCR) method. PCR analysis was also conducted to confirm or exclude cases of bovine leukemia and blue tongue serology positives, allowing a more precise evaluation of the presence of pathogen genetic material. Furthermore, *Leishmania spp.* and *Trypanosoma spp.* cultures were conducted from blood samples, using specific culture media and microscopic identification techniques. Serum antibodies occurrence was calculated using 95% confidence intervals, employing robust statistical methods to ensure result accuracy and reliability. Results reveal an occurrence of 82.14% for *Leptospira interrogans* (serovars Pomona, Icterohaemorrhagiae, Autumnalis, Bratislava, Canicola, and

Hardjo), indicating an elevated infection rate among these tapir populations. For blue tongue virus, occurrence was 71.43%, while porcine parvovirus showed an alarming occurrence of 100%. As concerning bovine leukemia virus, the positivity rate was 14.29%, and vesicular stomatitis virus presented a relatively modest occurrence of 7.14%. Other pathogens such as the viruses of eastern and western equine encephalomyelitis, bovine infectious rhinotracheitis, pseudorabies, classical swine fever, equine infectious anemia, foot-and-mouth disease, as well as the bacteria *Brucella abortus* showed no occurrence rate. This absence of specific antibody detection suggests a low occurrence of these pathogens in lowland tapir populations, which is crucial for understanding the health status of these animals and assessing the potential transmission risk to other species and public health. This study provides a preliminary overview of infectious agents affecting tapir in the Amazon. The findings underscore the importance of epidemiological surveillance to better guide conservation measures for these animals and their ecosystems.

### **P-14 First Record of *Probstmayria tapiri* in lowland tapirs (*Tapirus terrestris*), in the Central-Western Region of Brazil: Morphological description and future studies**

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The genus *Probstmayria* was originally described by Probstmayr in 1865 as *Oxyuris vivipara*, initially found in the cecum of domestic horses. The first record of *Probstmayria tapiri* in the wildlife of the Neotropical Americas was documented in a lowland tapir (*Tapirus terrestris*) in French Guiana in 1988. In this paper, we present the first record of *Probstmayria tapiri* in a lowland tapir in the Central-Western region of Brazil. The specimen was collected from the cecum of an adult female that died due to a vehicular collision on highway BR-267, with the nematodes separated from the intestinal contents, fixed in 70% GL alcohol, and a remaining portion fixed in 4% formaldehyde. Besides this species, two other morphotypes of nematodes belonging to the order Strongylida were separated and are undergoing morphological and molecular identification. Specimens of *P. tapiri* examined under light microscopy presented the following characteristics observed in male specimens: hexagonal oral aperture (18.8 µm in diameter), elongated pharynx (37.3 µm in length), esophagus with well-defined bulb (55.2 µm in length and 42.2 µm in width), excretory pore in chitinous vesicle (35.6 µm in length and 29.0 µm in width), uniform wide intestine, nine cloacal papillae, asymmetrical gubernaculum, hook-shaped spicules (66.2 µm

in length and 15.0  $\mu\text{m}$  in width at the base for the left; 41.5  $\mu\text{m}$  in length and 15.0  $\mu\text{m}$  in width at the base for the right), and a cylindrical tail (576.2  $\mu\text{m}$  distance from anus to tail tip). Females, on the other hand, had larger dimensions, with a total length of 2,115.1  $\mu\text{m}$  and width of 91.0  $\mu\text{m}$ . Their characteristics are similar to males, with a hexagonal mouth (17.4 - 20.3  $\mu\text{m}$  in diameter), cylindrical pharynx (40.5  $\mu\text{m}$  in length and 4.3 - 7.3  $\mu\text{m}$  in diameter), esophagus composed of a cylindrical body, a short isthmus, and a well-defined bulb (57.6  $\mu\text{m}$  in length and 47.6  $\mu\text{m}$  in width), nerve ring and excretory pore located at 173.1  $\mu\text{m}$  and 274.3  $\mu\text{m}$  from the apex, respectively, and a variable-sized uterus (294.6 - 356.7  $\mu\text{m}$  in length and 59.4 - 65.6  $\mu\text{m}$  in width) according to larval development stage. The intestine is uniformly wide, with width ranging from 47.2  $\mu\text{m}$  to 29.0  $\mu\text{m}$  toward the anus. The vulva is pre-equatorial, positioned at a distance of 289.1  $\mu\text{m}$  to 312.7  $\mu\text{m}$  from the anus, and the tail measures 656.1  $\mu\text{m}$  from anus to extremity. These results contribute to a better understanding of the characterization and identification of gastrointestinal parasites in *T. terrestris*. As part of our efforts to fill this knowledge gap, we plan to conduct morphological and molecular studies to deepen our understanding of this, and other, endoparasite species that can affect lowland tapirs.

## **P-15 A case study on the shape recognition of lowland tapirs in the Zoo Schwerin**

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To investigate their perception of the environment, the shape recognition of two lowland tapirs was studied in the Zoo Schwerin: A circle, a square and a triangle made of wood with the same surface area were hung up and only touching one of them, the circle, was rewarded with food. It was then observed how often the tapirs touched the rewarded shape until they lost interest or food went out. The experiment was carried out approximately twice a day over a span of two weeks. Recognition based on arrangement can be excluded due to changing layouts in the second week. Three tests were used to analyse the data in different ways: Results of the Friedmann test always showed high significance ( $p = 0,007$  or lower). For the additionally used Wilcoxon and Post hoc test, which compared circle and non-circle as well as two forms with each other, this is only true for both tapirs and all forms in the second week. Regardless, this may indicate the tapirs' ability to recognise shapes.

To verify these results, future studies with more tapirs, longer testing periods and a larger variety of forms are needed. Furthermore, the question remains whether the recognition of shapes is due to the proboscis or the eyes of the animals.

## **P-16 Howling shadows: First report of domestic dog attacks on globally threatened mountain tapirs in high Andean Cloud Forests of Colombia**

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Domestic dogs (*Canis lupus familiaris*) are recognized worldwide not only as man's best friend, but also as a form of anthropogenic edge effect impacting wildlife through predation, competition and disease infection. In the Northern Andes, there is growing evidence of dogs inducing activity shifts or alterations in the habitat use of native mammalian species. However, little information exists on direct attacks of dogs on wildlife, even in the case of species of conservation concern such as the mountain tapir (*Tapirus pinchaque*). Here, we used camera traps to report two cases of dogs chasing and attacking mountain tapirs in a protected area of the Central Andes of Colombia. The first event showed a direct physical contact between a living adult mountain tapir and two dogs, but the picture's angle did not lead to observable signs of wounds or other injuries. The second event showed an adult mountain tapir running while being chased by the same two dogs of the first event, denoting a stressful moment for the tapir. This may have negative consequences on the populations of mountain tapirs through decreased reproductive performance and foraging efficiency, increased potential for disease outbreaks and more. Population management and control of domestic dogs inside and around protected areas must be considered a priority in future conservation actions to support a healthy population of mountain tapirs and other imperiled species in the region.

## **P-17 Conservation genetics applied to a reintroduced population of lowland tapirs**

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Habitat loss and species extinctions are occurring at an increasingly rapid pace and in a more significant manner. To address this challenge, species reintroduction has emerged as a promising and effective strategy in restoring ecological processes and protecting threatened taxa. Reintroduction refers to the intentional movement of animals within a species' historical range, returning them to their natural habitat from which they had vanished, with the objective of reestablishing a sustainable, wild population. During this procedure, organisms may originate from the wild or from captivity. However, it brings about the need for careful selection of individuals destined for reintroduction. These animals must represent the evolutionary lineage from of the region in which they will be reintroduced and have sufficient genetic

variability to ensure adaptation, thus increasing the chances of establishing a self-sustaining population.

This study focuses on the reintroduction of the lowland tapir (*Tapirus terrestris*) in the Atlantic Forest of Rio de Janeiro. This is the largest terrestrial mammal in Brazil and, due to habitat loss and poaching, it was extinct in the state of Rio de Janeiro. Therefore, the aim of this study was to analyze the genetic diversity of the reintroduced tapir population in Guapiaçu Ecological Reserve (REGUA), Rio de Janeiro, and guide ex-situ management and future reintroductions. To achieve this, samples from 47 tapirs kept at 13 different captive facilities were collected, of which 18 tapirs were reintroduced. For phylogenetic analyses, the mitochondrial Cytochrome b gene was used, and sequences from free-living tapirs from previous studies were included.

The phylogenetic analyses recovered four evolutionary lineages. Both reintroduced and captive tapirs predominantly belong to Clade IV, a clade that extends from the southern Amazon to northern Argentina. Furthermore, the current results suggest a possible extension of this clade into the Atlantic Forest biome. However, three individuals grouped with other clades present only in the Amazon biome. Therefore, for reintroduction in the state of Rio de Janeiro and other parts of Atlantic Forest, it would be ideal to select tapirs that group with Clade IV.

Results showed that all reintroduced tapirs belong to Clade IV. Additionally, the use of animals from different captive facilities has proven to be positive for the genetic diversity of the reintroduced population. These findings highlight the importance of considering genetics and adaptation for the success of reintroduction programs, especially in fragmented habitats such as the Atlantic Forest.

### **P-18 Amy's story: One tapir calf's survival story**

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Amy the tapir was initially pulled for whatever reason from another facility and only had access with dam for small period so suspect partial failure of passive transfer. Initial ecoli overgrowth and general dysbiosis responsive to oral sulfa drugs: parasite- negative, giardia- negative, coccidia- negative. Continued to appear to have sensitivity to any diet change. Numerous supportive care transfaunation and fecal transplants with general subsiding of diarrhea with combined treatments and supportive care. After spending 65 days in emergency veterinary care with Exotic Wildlife Veterinary Services she seemed to have some resolution however, after switching facilities to Highpoint Haven, diarrhea came back. Ultimately suspicion of inflammatory bowel disease and considered

intestinal and rectal biopsies but trialed low dose oral dexamethasone . Appeared to have quick to immediate response, maintained for some time then tapered dose before cessation of treatment. No returning of the chronic diarrhea appeared to have resolved. Suspect initial diarrhea from ecoli overgrowth and general dysbiosis that caused chronic low grade inflammation. Leading to a chronic state of inflammation in GI tract that was reactive to changes in microflora and diet in general. Used steroids to calm gi tract down enough to allow less reactivity and finally normal bowel responses. Amy was born on April 1, 2023 and medically cleared in October 2023.

She now lives with another tapir, Wally and they have established a normal and healthy relationship. While we have not had any major episodes since, consideration on slow introductions of food items is taken. Our hope is that Amy's story may help another tapir out there.

### **P-19 Ethogram of wild and captive lowland tapir (*Tapirus terrestris*, Linnaeus, 1758)**

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The Lowland Tapir, *Tapirus terrestris*, an ungulate from Tapiridae family, is the largest terrestrial mammal in Brazil, a herbivore responsible for seed dispersal, specially large seeds that can not be dispersed by smaller animals. Although it has great importance, it is listed as Vulnerable in the IUCN Red List of Threatened Species and its populations are declining in most biomes. Knowing the behavior of a threatened species enables understanding the species habits and how they interact among themselves, with the environment and other species, providing information that help and support conservation strategies. Considering the absence of a behavior repertoire description for *Tapirus terrestris*, we elaborated an ethogram based on ad libitum methodology.

The data was collected in two sites: in a disabled plum production in Elgueiro's Farm, inserted in one of the most important Atlantic Forest remaining, at the edge of Carlos Botelho State Park, where the data was collected between January 18th and February 15th, 2022, with daily observations between 4 p.m. and 8 p.m.; and in São Carlos Ecological Park for 12 months starting in May 27th, 2018, describing its behavior and the interactions between mother and offspring were included in the ethogram, creating a description using *ex situ* and *in situ* data.

The ethogram was built with 34 behavior's description, included in 14 behavior's categories, having behaviors descriptive only for *ex situ* individuals, such as public

interactions and the description of maternal behaviors, while others were observed exclusively in situ, such as the interspecific interactions with *Mivalgo chimachima*, vocalizing during the observations and the protooperation. The antagonistic behaviors were mainly descriptive using in situ observations, which might be related to territory occupancy and resources partitioning.

The ethogram elaboration is an essential part of behavioral ecology, being the first step in studies about a species behavior and its intraspecific and interspecific relationships. Due to the absence of any kind of behavior description for Tapirs in the Brazilian Atlantic Forest, this study presents a novel approach for studies including *T. terrestris* in Brazil, guiding not only the behavior's repertoire in the Atlantic Forest, but also for other biomes' individuals. The knowledge about how a species behaves, interacts with other species and with the environment is essential for helping conservationists to adopt the best strategies for such species.

### **P-20 Population density of the lowland tapir (*Tapirus terrestris*) in a protected area (Atlantic Forest, Brazil) using spatially explicit capture-recapture model**

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The lowland tapir (*Tapirus terrestris*) plays an important role in the ecosystem, shaping the structure and function of the landscape and the environment. In the Atlantic Forest, there are few remaining viable populations of the species, due to the various anthropogenic pressures. The comprehension of the population's status is essential to support the development of better conservation strategies. In this study, we aimed to estimate the population density and size of tapirs in Carlos Botelho State Park, a priority Protected Area for scientific research and conservation of tapirs. For data collection, we distributed 60 sampling sites in a grid spaced approximately 1 km, between December 2015 and May 2016, resulting in a sampling effort of 4149 traps/day. We estimated the population density using the Spatially Explicit Capture and Recapture (SECR) Model, with ten environmental and anthropogenic variables, in addition to a spatial covariate based on altitude (above and below 600m altitude). We identified 20 tapirs (10 females and 10 males) in 63% of the records. The null model with all variables constant ( $D \sim 1$   $g_0 \sim 1$   $\sigma \sim 1$ ) best fitted the data and resulted in an estimate of  $37,25 \pm 10,97$  ind/100km<sup>2</sup>. However, we considered that the model with variation in spatial density ( $D \sim \text{altitude}$   $g_0 \sim 1$   $\sigma \sim 1$ ) was biologically more plausible, as it suggests a difference in density influenced by altitude,  $46,61 \pm 15,18$  ind/100km<sup>2</sup> in the region above 600m and  $23,80 \pm 12,19$  ind/100km<sup>2</sup> in the region below 600m. Considering the estimate of 100 individuals for the highest region and

39 tapirs for the lowest region, the tapir population estimated for the PECB was approximately 139 individuals. The estimated population density values for PECB tapirs are within the range of estimates already obtained for the species throughout its geographic distribution and demonstrate the PECB's contribution to the region housing a viable population of tapirs (>200 individuals). Our results suggest that the greater concentration of individuals in higher altitude areas can be related to the resources provided for their survival, such as greater availability of food, water and lower risk of predation. This study makes a first contribution to knowledge about the conservation status of the tapir, also bringing an approach involving the landscape and reinforcing the importance of PECB in maintaining the species' population in the Atlantic Forest.

## **P-21 Description of the masticatory apparatus of two specimens of *Tapirus terrestris***

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The masticatory apparatus presents characteristics associated with chewing types and the diet. Masticatory movements are determined by the morphological characteristics of the temporomandibular joint and the muscles of mastication. The study of the masticatory apparatus contributes to the understanding of feeding behavior, and allows the design of nutritional strategies in Ex situ animals. With the goal to describe the masticatory apparatus, two specimens of *Tapirus terrestris*, males aged 23 and 19 years, were dissected. Both from the Córdoba Biodiversity Park. The *Caput mandibulae* is ellipsoidal and convex in the rostrocaudal direction. Its long axis deviates caudoventrally from the transverse plane. The *Fossa mandibularis* of the temporalis is shallow. The *Processus retroarticularis* curves medially containing the medial end of the *Caput mandibulae*. The *Discus articularis* is ellipsoidal, biconcave along its long axis. The articular capsule contains, caudally, a retroarticular adipose body. The *Ligamentum laterale* joins the *Processus zygomaticus* of the temporalis with the lateral surface of the *Collum mandibulae*. The *Ligamentum caudale* joins the *Processus retroarticularis* with the caudal edge of the *Collum mandibulae*. A longer, elastic ligament accompanies it laterally. The superficial part of the *Musculus masseter* originates from the facial crest and inserts into the mandible. Laterally, it is aponeurotic and its fleshy fibers appear in the ventral third, with a caudoventral, and caudal direction. Medially, it has fan-shaped fibers. The deep part of the *Musculus masseter* is pennate and ovoid, with an intermediate aponeurosis. It originates on the ventral surface of the *Arcus*

*zygomaticus*. It is inserted laterally to the edge of the mandible. Its fibers are arranged dorsoventrally. Medially it has a short portion that originates from the medioventral edge of the *Arcus zygomaticus*, inserting into the neck and caudal part of the body of the mandible, near the alveolar processes. The *Musculus temporalis* is pennate and its fibers converge caudally to the orbit. It has aponeurotic origin in the *Crista sagitalis externa*. It inserts into the *Processus coronoideus* of the mandible. The *Musculus pterygoideus medialis* has a rostral portion, originating in the basisphenoid, and a caudal portion, in the *Hamulus pterygoideus*. The fibers of the rostral portion are arranged vertically and those of the caudal portion, caudoventrally. The *Musculus pterygoideus lateralis* is short, fleshy, and conical. Its fibers are arranged horizontally and caudoventrally. It originates from the basisphenoid and inserts into the *Collum mandibulae*, medial to the capsule of the temporomandibular joint. The *Musculus digastricus* runs between the *Processus paracondylaris* of the occipital and the medial surface of the body of the mandible. It has two bellies; rostral and caudal, joined by an intermediate tendon. It has an occipitomandibular portion, which is separated from the caudal belly and inserted medial to the angle of the mandible. The arrangement of the articular components and the masticatory muscles suggests that the opening and closing movements of the mouth are combined with protraction and retraction movements. Lateralization movements are limited by the orientation of the long axis of the articular surfaces and the medial prolongation of the *Processus retroarticularis*.

## **P-22 Corneal pathologies in lowland tapirs (*Tapirus terrestris*), multidisciplinary study: clinical, pathological, therapeutic, Parque de la Biodiversidad (Former Zoológico de Córdoba)**

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Captive tapirs often exhibit debilitating eye disease, frequently in the form of corneal ulcerations (Da Silva, *et al.*, 2013). The aim of this study was to describe two cases of corneal pathologies in Tapirs (*Tapirus terrestris*), through a multidisciplinary study: clinical, pathological and therapeutic, in the Parque de la Biodiversidad, Argentina. Both tapirs were held in the zoo, with a diet (dry matter basis), based on 26% water, energy kcal/g 2.22, protein 14.94%, fat 3.40%, NDF 34, 60%, ADF 24.78, Ash 2.97%, Vit. A 39.55 IU/g, Vit. E 3.12 IU/kg, Ca 0.99%, P 0.30% and Ca:P ratio 3.26:1. Case 1 is a 18 year old male with progressive chronic bilateral

withish opacity of the cornea. The evolution of the disease is 2 years and it was not responsive to treatment. Case 2 is a 23 years old male, with corneal progressive chronic bilateral whitish opacity not responsive to treatment. Treatment for both cases coinsisted in cyclosporine 2% Love® in eye drops, 1 drop every 12 hours with controls every 60 days and a total duration of 484 (case 1) and 280 days (case 2). At the ophthalmological examination both cases showed stromal focal edema with superficial neovascularization diffuse nebulae, and no epithelial alterations were observed in the cornea. Preserved visual functionality (+) and little compromised ocular structures were observed, Tear Breakup Test (+7 seconds), Fluorescein Test (-), threat reflex (+), photochromic reflex (+), Dazzle (+), reflex direct photopupillary (+), indirect photopupillary reflex (+) and Slit lamp without abnormalities of the corneal epithelium. The macroscopic pathological study described a diffuse corneal opacity from the lateral sclerocorneal edge towards the center, for the two cases described. Case 1 histological findings: normal limbic hyperpigmentation of the organ, corneal degenerative epithelias changes with dysplasia; projection of the corneal epithelium towards the stroma (rete ridge); fibrovascular proliferation of the superficial stroma and the underlying vessels with isolated plasma cells. Case 2 histopatology is in process of confirmation. Other treatments in tapir with corneal ulcers have been described in the literarure, different to cyclosporie 2% in eye drops applied in our cases, consiste of topical ophthalmic solutions of tobramycin sulphate (TrazilOfteno® 3 mg/ml) 1-2 drops every four hours, diclofenac sodium (3-A Ofteno 1 mg/ml) 1-2 drops every eight hours and deproteinized calf serum (Solcoseryl® Ophthalmic Gel 10%) 1 cm of gel every eight hours, and treated similarly with tobramycin sulphate and deproteinized calf serum (Da Silva, et al., 2013). Corneal pathologies are ocular diseases that occur in tapirs. Possibly environment, genetic factors, senility effects and infections, play a risk factor. We are currently evaluating immunohistochemical (IHC) as diagnostic method.

## **P-23 Estimating the age of young lowland tapirs based on pelage pattern evaluation**

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Estimating the age of young lowland tapirs (*Tapirus terrestris*) through skin pattern relies on the changes in the tapir calf coat as it ages. Lowland tapirs, like many other mammal species, undergo changes in their skin pigmentation and pattern as they mature. However, this method is not as precise as other techniques like dental

analysis or growth measurements. Typically, tapir calves have distinct patterns on their skin – including spots, stripes, or other markings – which may fade or change as they grow older. By observing these patterns and comparing them to known characteristics of tapir calves at different ages, researchers and conservationists can make educated guesses about the age of a particular individual. Observations of tapirs in the wild and in captivity suggest that changes in pelage pattern can occur gradually over their first year of life. Based on photographs taken from zoo-born tapirs with known dates of birth, along with information recovered from wild tapirs recorded in photos and videos from camera-traps in the Pantanal from 2010-2022, the Lowland Tapir Conservation Initiative (LTCI-IPÊ) developed and published a protocol entitled PROTOCOL FOR AGE ESTIMATION OF YOUNG LOWLAND TAPIRS BASED ON PELAGE PATTERN EVALUATION. This document poses as a valuable tool to gather important information used to determine reproductive parameters that are crucial to tapir Population Viability Analysis (PVA).

## **P-24 Monitoring the reproductive aspects of Brazilian tapirs during the dry season in the Pantanal biome**

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Even though the Brazilian tapir (*Tapirus terrestris*) is the only remaining representative of the South American Megafauna, its population has been decreasing mainly due to advances in agriculture and livestock farming. As the Pantanal biome is considered a stronghold for the Brazilian tapir, the region is suggested as a priority for the survival of the species over the next 100 years. The aim was to describe some reproductive aspects, as the reproductive endocrine and vaginal cytology parameters, of female Brazilian tapirs monitored during dry season in Pantanal. After capture and chemical restraint, a total of 17 females were grouped, according to its estimated age, as pre-pubertal (under 16 months), sub-adults (17-45 months), adults (48-180 months) and senile (over 180 months), and their weight was estimated. Blood samples were collected for progesterone and estrogen determination by radioimmunoassay, using a Wizard detector (PerkinElmer do Brasil Ltda) and commercial kits. Moreover, vaginal smears were taken using a sterile swab introduced through 9th the vulvar commissure to the cranial vagina, and stained using the Diff Quick method, according to the manufacturer's instructions. The samples were analyzed under an optical microscope (x400) and the cells were classified as basal, parabasal, intermediate or surface cells (1). Data from female tapirs were collected from April to November, during dry season of the Pantanal biome. Data were expressed as mean values ( $\pm$  SEM). A Spearman correlation test

was performed to verify the relationship between hormonal concentrations and the proportion of cell types found by vaginal cytology. Females were distributed as 2 prepubertal weighting  $85.0 \pm 15.0$  kg, 5 sub-adults with  $180.0 \pm 10.1$  kg, and 10 adults with  $250.0 \pm 5.6$  kg. There were no differences ( $P > 0.05$ ) in estrogen values according to the aging group, whose mean values were  $112.9 \pm 4.7$  pg/mL (prepubertal),  $100.1 \pm 8.6$  pg/mL (subadults) and  $118.3 \pm 26.9$  pg/mL (adults), respectively. With regard to progesterone levels, the values obtained for adult females ( $1.6 \pm 0.7$  ng/mL) were higher than those of the subadults group ( $0.0 \pm 0.2$  ng/mL) ( $P < 0.05$ ). Regarding vaginal cytology, we identified a predominance of intermediate cells in smears from prepubertal young ( $15.0 \pm 15.0\%$ ), subadults ( $56.5 \pm 9.8\%$ ) and adults ( $47.0 \pm 9.2\%$ ). No correlation was found between hormonal concentrations and cell types analyzed in vaginal cytology ( $P > 0.05$ ). Additionally, hormonal patterns from female tapirs were well distributed during all the dry season in Pantanal, and we did not identify any prevalence of estrogen peaks relative to a concentration of estrus occurrence in any of the months studied. We provided initial data related to reproductive aspects of Brazilian tapir in Pantanal. Apparently, vaginal cytology appears to be inefficient in monitoring the endocrine patterns of the species.

## **P-25 Morphological description of the larva of the tick *Amblyomma incisum* (Acari: Ixodidae), parasite of the lowland tapir**

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The tick *Amblyomma incisum* is popularly known during its adult stage as the “tapir incised festoon tick”, since the male presents this peculiar morphological characteristic, with the Lowland Tapir being its primary host. Adults and nymph have already been described, but the larva lacks description and is not yet known to science. The objective of the present study was to describe the larva of this tick species through scanning electron and optical microscopy, bringing the following results: *Idiosoma* (Unfed) + *Gnathosoma* (Capitulum). Length from apex of hypostome to posterior body margin  $0.987 \pm 0.015$ . *Idiosoma*. Length from apices of scapula to posterior body margin  $0.806 \pm 0.013$ , maximum breadth  $0.725 \pm 0.019$ , breadth/length ratio  $0.899 \pm 0.021$ . Body outline rounded, with 11 festoons without tubercles, central festoon  $0.072 \pm 0.006$  breadth, without seta. Anal aperture on central portion

of opisthosoma,  $0.043\pm 0.003$  length,  $0.049\pm 0.003$  breadth. Scutum,  $0.394\pm 0.011$  length,  $0.595\pm 0.014$  breadth, breadth/length ratio  $1.508\pm 0.054$ ; inornate, surface slightly shagreened, few punctations, outline subtriangular with posterior margin slightly sinuous. Eyes slightly bulging and shallow, located at lateral scutal angles at the level of scutal midlength. Distance between cervical grooves  $0.151\pm 0.004$ ,  $0.138\pm 0.008$  length, distinctively extending parallel to the proximities of scutal setae (Sc3), distance between (Sc3)  $0.079\pm 0.011$ . *Gnathosoma*. Length from apex of hypostome to posterior basis margin  $0.232\pm 0.004$ , maximum breadth  $0.228\pm 0.004$ , breadth/length ratio  $0.985\pm 0.019$ . Basis capitula, dorsally subrectangular in shape, with straight posterior margin, without cornua; 1 pair of dorsal sensillum (S) on median line, distance between (S)  $0.130\pm 0.004$ , length from (S) to posterior basis margin  $0.047\pm 0.003$ ; posterior margin convex ventrally, without ventral cornua; 1 pair of ventral posthypostomal setae (Ph1), distance between (Ph1)  $0.036\pm 0.003$ , length from (Ph1) to posterior ventral margin  $0.130\pm 0.003$ ; length from palpal apices to posterior basis margin  $0.249\pm 0.007$ . Palpi cylindrical  $0.163\pm 0.005$  length. Article I  $0.024\pm 0.002$  length,  $0.049\pm 0.001$  breadth, without ventral prolongation. Article II  $0.073\pm 0.003$  length,  $0.066\pm 0.001$  breadth. Article III  $0.066\pm 0.004$  length,  $0.061\pm 0.002$  breadth. Article IV apically projected from article III. Articles II and III each more than twice as long as I and IV; sutures between all articles distinct. Hypostome compact, rounded apically, length from apices to (Ph1)  $0.119\pm 0.004$ , maximum breadth  $0.064\pm 0.002$ , length of toothed portion  $0.080\pm 0.004$ , dentition 2/2 throughout with 6–7 teeth per row, apical corona with minute denticles. Legs. Leg relatively long and robust. Coxa I,  $0.138\pm 0.006$  length,  $0.110\pm 0.019$  breadth, with 2 triangular spurs, the external two times longer than the internal; Coxa II  $0.149\pm 0.010$  length,  $0.170\pm 0.007$  breadth, with 1 short triangular spur. Coxa III  $0.154\pm 0.009$  length,  $0.159\pm 0.011$  breadth, with 1 short triangular spur. Trochanter without spur. Tarsus I  $0.263\pm 0.003$  length,  $0.096\pm 0.004$  breadth. Tarsus III  $0.208\pm 0.009$  length,  $0.073\pm 0.002$  breadth.

## **P-26 Ticks (Acari: Ixodidae) on lowland tapirs (*Tapirus terrestris*) in the Sorocaba metropolitan region, São Paulo, Brazil**

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Tapirs have been recognized as very important hosts for the maintenance of the life cycle of tick species, under "*in-situ*" and "*ex-situ*" conditions. The goal of this

study was to evaluate the diversity of ticks on wild and kept under human care lowland tapirs (*Tapirus terrestris*) in the Sorocaba Metropolitan Region, São Paulo State, Brazil. From 1991 to 2024, during routine in the Sorocaba Zoo and carcass examinations of free-ranging animals rescued by the environmental police and sent to the Sorocaba Zoo, 35 tapirs were examined for the presence of ticks. Among 35 examined animals during 33 years, 11 tapirs were free-living and 24 animals from the Sorocaba Zoo. Ticks were collected and sent to two laboratories, FIOCRUZ and FMVZ-USP. The ticks were taxonomically identified based on current literature, and further deposited in the tick collections of the two Institutions. The following tick species were identified: *Amblyomma brasiliense*; *Amblyomma calcaratum*; *Amblyomma dubitatum*; *Amblyomma incisum*; *Amblyomma ovale*; *Amblyomma paca*; *Amblyomma sculptum*; *Amblyomma sp.*; *Dermacentor nitens*; *Haemaphysalis juxtakochi* and *Rhipicephalus microplus*. In total there were collected 573 ticks: 183 larvae (31,93%); 154 nymphs (26,88%); 149♂ (26,00%) and 87♀ (15,18%). Overall, ten different tick species were found on tapirs, at different stages of development (larvae, nymphs and adults), corroborating their role as an important tick host in the Sorocaba Metropolitan Region. Ticks are recognized as vectors of a wide range of pathogens for animals and humans, which can cause economic losses, besides serious illnesses that can lead to death. Recent studies showed positive human cases of Brazilian Spotted Fever, caused by bacterium *Rickettsia rickettsii* in the Sorocaba Metropolitan Region. It is unknown exactly how tapirs are involved in tick-borne pathogens transmission, but *A. sculptum* tick species are certainly involved. Further studies are needed on the occurrence of tick-borne pathogens in wild animals.

## **P-27 Occurrence of hard ticks on lowland tapirs in the Brazilian Amazon**

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Among the species of Brazilian mammal fauna, the lowland tapir (*Tapirus terrestris*) curiously plays an important role in the tick fauna, especially ticks of the genus *Amblyomma*. It is noteworthy that reports of five or more tick species on a single individual are not rare and therefore, this host represents the greatest diversity of ticks on a single host species in Brazil. At least nine species of ticks in the country use tapirs as primary hosts for the adult stage: *A. cajennense*, *A. coelebs*, *A. incisum*, *A. latepunctatum*, *A. oblongoguttatum*, *A. ovale*, *A. scalpturatum*, *A. sculptum* and

probably *A. yucumense*. The goal of this study was to evaluate the diversity of ticks on free-ranging and road-killed lowland tapirs in the Brazilian Amazon. From 2021–2023, during the research routine in the Lowland Tapir Conservation Initiative (LTCI-IPÊ), two carcasses of wild tapirs (Ribeirão Cascalheira and Rondonópolis municipalities in the state of Mato Grosso-MT), and 32 free-ranging tapirs were examined for the presence of ticks (Querência-MT and Parauapebas municipality in the state of Pará). Ticks were collected and sent to the laboratory of the FMVZ-USP, where they were identified based on taxonomic keys and current literature. The following tick species were identified: *A. cajennense* (n=561); *A. coelebs* (n=50); *A. naponense* (n=1); *A. ovale* (n=25); *A. scalpturatum* (n=14); *A. sculptum* (n=22); *A. triste* (n=2); *Amblyomma sp.* (n=4) and *Rhipicephalus microplus* (n=3). In total, there were 682 tick specimens: 4 larvae (0,58%); 234 nymphs (34,31%); 183 males (26,83%) and 261 females (38,27%). Overall, eight different tick species were found on tapirs, at different stages of development (larvae, nymphs and adults), corroborating tapirs as an important tick host in the Brazilian Amazon. The presence of the *R. microplus* tick collected on tapirs demonstrates the proximity between native fauna and domestic cattle, since *R. microplus* is an exotic tick of Asian origin that is now widely distributed throughout the Brazilian territory, including the Amazon biome. This way, the Amazon's deforestation for the implementation of cattle pastures may favor the encounter of a non-native tick with tapirs, enabling the transmission of pathogenic agents that cause diseases, from domestic animals to wild animals native to Brazil. This hypothesis should be investigated in the national territory in the near future.

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# PAPER SESSIONS

## PAPER SESSION 1 SPATIAL ECOLOGY [PART 1]

Moderator: JULIANA VÉLEZ

### [PS1-1] Movement Ecology of Vulnerable Lowland Tapirs Between Areas of Varying Human Disturbance

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Animal movement is a key ecological process that is tightly coupled to local environmental conditions. While agriculture, urbanization, and transportation infrastructure are critical to human socio-economic improvement, these have spurred substantial changes in animal movement across the globe with potential impacts on fitness and survival. Notably, however, human disturbance can have differential effects across species, and responses to human activities are thus largely taxa and context specific. As human disturbance is only expected to worsen over the next decade it is critical to better understand how species respond to human disturbance in order to develop effective, case-specific conservation strategies. Here, we use an extensive telemetry dataset collected over 22 years to fill a critical knowledge gap in the movement ecology of lowland tapirs (*Tapirus terrestris*) across areas of varying human disturbance within three biomes in southern Brazil: the Pantanal, Cerrado, and Atlantic Forest. From these data we found that the mean home range size across all monitored tapirs was 8.31 km<sup>2</sup> (95% CI 6.53–10.42), with no evidence that home range sizes differed between sexes nor age groups. Interestingly, although the Atlantic Forest, Cerrado, and Pantanal vary substantially in habitat composition, levels of human disturbance, and tapir population densities, we found that lowland tapir movement behavior and space use were consistent across all three biomes. Human disturbance also had no detectable effect on lowland tapir movement. Lowland tapirs living in

the most altered habitats we monitored exhibited movement behavior that was comparable to that of tapirs living in a near pristine environment. Contrary to our expectations, although we observed individual variability in lowland tapir space use and movement, human impacts on the landscape also had no measurable effect on their movement. Lowland tapir movement behavior thus appears to exhibit very little phenotypic plasticity in response to human disturbance. Crucially, the lack of any detectable response to anthropogenic disturbance suggests that human modified habitats risk being ecological traps for tapirs and this information should be factored into conservation actions and species management aimed towards protecting lowland tapir populations.

## **[PS1-2] Ecological Experiment Reveals Increased Lowland Tapir Encounter after Cattle Exclusion in Neotropical Forests**

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Ongoing habitat loss and species extinctions require managers to implement and quantify the effectiveness of conservation actions for protecting biodiversity. Fencing, when done properly, is an important management tool for conservation in landscapes where wildlife and domestic animals co-occur, potentially enhancing habitat use through selective exclusion of domestic species. For instance, fencing of forest patches in the Neotropics is expected to reduce degradation of understory vegetation by cattle, releasing these resources for the native community of browsers and fruit consumers. Here, we implemented an ecological experiment via a before-after control-impact (BACI) design to quantify the effect of cattle exclusion on habitat use of the native community of browsers and fruit consumers, and percent ground cover in multifunctional landscapes of the Colombian Orinoquía. We built ~14 km of wildlife-permeable fences along forest edges in four forest patches (i.e., blocks) containing control and fenced (treatment) sites. We installed 33 camera traps to obtain information about wildlife and cattle habitat use, before and after the fences were constructed. We used Bayesian generalized linear mixed effects models to quantify the effect of fences via the interaction between the time period (before and after the fences were built) and treatment (control or fenced sites). Fencing was effective at reducing encounter probabilities of cattle in the treated sites, and it had a positive impact on relative encounter probabilities of the lowland tapir (*Tapirus terrestris*) and other wildlife species including the black agouti (*Dasyprocta fuliginosa*), spotted paca (*Cuniculus paca*), and South American coati (*Nasua nasua*), inferred by the BACI contrast for the

interaction between Time (before-after fence construction) and Treatment (control and fenced sites). We provide experimental evidence that fences are effective at selectively excluding cattle and increasing encounter rates of wild browsers and fruit consumers in forest patches where these species co-occur with cattle. Our results highlight an important application of fencing ecology in Neotropical forests, where the implementation of wildlife-permeable fences is feasible due to smaller body sizes of wildlife compared to domestic animals such as cattle.

### **[PS1-3] Occupancy and Effects of Land Use on the Lowland Tapir (*Tapirus terrestris*) in the Ranching Landscape of the Paraguayan Dry Chaco**

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Using 339 camera trap sampling stations across four sites in the ranching landscape in Paraguayan Dry Chaco we collected 33,135 trap nights of detection/non-detection data for lowland tapirs. Using single-species spatial occupancy modeling we estimated site occupancy of tapirs in relation to land use while accounting for spatial autocorrelation among sampling stations. Occupancy was relatively high across sites, ranging from 55% to 86%. On average, occupancy in forested sites was 62% (95% CRI 34-99) and 47% (95% CRI 20-99) in pastures. There was a 93% probability that forested sites had higher occupancy than sites in pastures. Our results illustrate some tolerance to land use change in the Paraguayan Dry Chaco if forest remnants are conserved, however, we also show that there is a pronounced preference of forest over pasturelands. These results have strong implications on the sustainability of agricultural production models, especially on the form and disposition of forest reserves.

## **[PS1-4] Distribution, Habitat Use, and Conservation Areas of the Lowland Tapir (*Tapirus terrestris*) in the Orinoquia Region of Colombia**

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The lowland tapir (*Tapirus terrestris*) is distributed throughout much of South America and is considered a keystone species because it fulfills crucial ecological roles in tropical forests. Tapirs are associated with forest ecosystems and water bodies throughout their geographic range. In the Orinoquia region of Colombia tapirs are found in natural savannahs, and in dense, gallery and riparian forests. Although there is data available on tapir natural history, basic knowledge is still lacking across much of its distribution. We generated a baseline of tapir distribution to assess habitat use and conservation areas across the Orinoquia and developed a database of 143 individual occurrences from camera trap sampling conducted in the departments of Arauca, Casanare, Vichada, and Meta. We used 21 environmental covariates including forest cover layer, water occurrence and the 19 bioclimatic variables from CHELSA Bioclims Version 2.1 at high resolution (30 arcsec, ~1 km) to model distribution using the R Wallace 1.1.3 package and Maxent 3.4.4. The total distribution area of the species comprises 134,544 km<sup>2</sup>, where 71.56 % corresponds to available suitable habitats. Precipitation of the coldest quarter (24%), precipitation seasonality (22.8%) and temperature seasonality (22.4%) were the most important predictor variables for tapir distribution. Tapir populations likely became locally extinct in the southern part of the department of Casanare. Our results constitute the first approximation of the distribution of the lowland tapir for the Orinoquia region of Colombia and allowed us to identify and establish tapir conservation units (TCU). Tapirs are crucial biological tools for prioritizing conservation and restoration efforts throughout their geographic range. Distribution and niche modeling offer replicable methodologies that can be implemented in South America to generate large-scale conservation strategies with a greater impact for tapirs and their ecosystems.

## **[PS1-5] Biological Corridors and Occupancy Probabilities of the Lowland Tapir (*Tapirus terrestris*) in the Orinoquia Region of Colombia**

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The lowland tapir has the widest geographic range of all extant tapir species. Overall, populations have declined by an estimated 33% over the past 30 years as a result of habitat loss, forest fragmentation, and poaching. Despite existing information, studies related to the tapir in the Orinoquia region of Colombia are limited. For this

reason, the project focused on estimating occupancy, activity patterns, and relative abundance of the lowland tapir in nine different areas across the Departments of Arauca, Casanare, Vichada, and Meta. In general, the highest probability of occupation occurred in Arauca, which is influenced by deforestation due to crop expansion and predation by jaguars and pumas. This area is estimated to have the highest concentration of individuals due to the well-preserved state of its forest cover. Due to this, a biological corridor was designed in Arauca for the prioritization of new protected areas, selection of restoration processes, and development of scientific research for the conservation of the lowland tapir. The corridor consists of 10 key conservation blocks that correspond to core conservation areas based on the ecological requirements of the species (e.g., geographical range). The layout of these core areas allows longitudinal and transverse connectivity between the dense, gallery, and riparian forests associated with the main rivers of the Department.

Conversely, in Vichada the probability of occupation is conditioned by fires and reforestation processes with exotic plant species that are affecting natural savannas and gallery/riparian forests. The results in Casanare differed considerably, with protected areas and wetlands as the main conditioning factors. This region faces a combination of pressures (i.e. oil palm, rice, oil extraction) threatening tapir populations, as nearly 70% of the forest cover has been lost in the last 30 years. Finally, in Meta the gallery forest and dense forest are showing different occupancy and detection probabilities as a consequence of crops and pasture expansion for livestock. Additionally, the activity patterns are changing considerably between areas, likely in response to the incidence of human impacts and deforestation. These results show that tapirs are responding differently to several environmental conditions that can affect their occupation in heterogeneous landscapes. Regional evaluations of occupancy and detectability, such as this study, provide a broad understanding of the various factors affecting tapirs and are crucial to inform regional conservation strategies.

## **[PS1-6] Spatial Ecology of the Genus *Tapirus* spp. in Colombia**

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In Colombia, three of the four recognized tapir species are recorded, making the country the largest diversity hotspot for the *Tapirus* genus in the world. The mountain tapir (*Tapirus pinchaque*) inhabits the ecosystems of the Central

and Eastern Andes, lowland tapir (*T. terrestris*) in the Caribbean, Orinoquia and Amazonia, and the Central American tapir (*T. bairdii*) in the north of the biogeographic Chocó and Caribbean. We carried out spatial analyses to evaluate the representativeness of tapir species distributions within the protected areas system, the different types of ecosystems, community areas such as indigenous reserves, community councils of afro-descendant communities, and peasant reserves, and we also calculated the Human Spatial Footprint Index - IHEH. We found that the three species of tapirs inhabit 50 different types of natural ecosystems and are distributed over 631,068 Km<sup>2</sup> (55%). The area of occurrence of tapirs is under the jurisdiction of 27 of the 41 regional and urban environmental authorities, and 139,008 Km<sup>2</sup> (22%) of the distribution area of the three species is under the conservation of the National System of Protected Areas. We report high levels of habitat transformation for the three species are evident in the change of natural cover, the construction of road infrastructure projects, and the demographic increase of the human population. It's urgent to design and implement adaptation strategies for climate change, promoting the conservation of tapirs and the ecosystem services that these ungulates provide, such as seed dispersal and the contribution to the regulation of carbon and hydric cycles.

# PAPER SESSIONS

## PAPER SESSION 2

### SPATIAL ECOLOGY [PART 2]

Moderator: RAFAEL REYNA-HURTADO

#### **[PS2-1] Influential Factors in the Occupancy and Activity of the Last Megaherbivore from the Andean Cloud Forest**

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Mountain tapirs (*Tapirus pinchaque*) are the last megaherbivores of the northern Andean cloud forests, yet little is known about their ecology and natural history. This is a key species and is a priority for developing conservation actions to reverse their global population decline. Here we used hierarchical occupancy models, moonlight models, circular statistics, and kernel density probability functions to gain new insights into the habitat requirements of mountain tapirs in two protected areas of the Central Andes, Colombia. We used data from two camera trap surveys conducted between December 2016 – March 2017 and March – November 2021 to analyze the habitat use and activity of mountain tapirs with habitat structure, human disturbance, topography, and moonlight. We analyzed data from 81 sampling stations with a sampling effort of 5,594 traps/nights in an area of 53.7 km<sup>2</sup>. We found that habitat use of mountain tapirs was mainly related to the non-linear effect of elevation and that detection probability was strongly and positively related to proximity to water bodies and closer spacing of the sampling sites. We described the activity of mountain tapirs as being mainly cathemeral with a nocturnal behavior greatly associated with the darkest nights, even in periods of full moon. The moonlight model provides consistent evidence of mountain tapirs showing lunar phobic behavior during the two surveys, which might suggest a tradeoff between food acquisition and safety. Our findings enforce the fact that the mountain cloud forests in the western foothills of the Central Andes of Colombia can be considered an important conservation stronghold for the species. We encourage researchers to assess whether the observed patterns can be extended towards more degraded landscapes across the species distribution as well as to understand its relationships with the predator's assemblage and tourism activities.

## **[PS2-2] Co-Occurrence of Mountain Tapirs, Pumas and Andean Bear under Livestock Encroachment in the Tropical Andes of Colombia**

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Protected areas in the Andes Colombia exist as coupled natural-human ecosystems where human activities are increasingly forcing wildlife to adjust behaviors. For endangered species, such as the mountain tapir that rely largely on protected areas for their persistence, they must balance these anthropogenic pressures and natural predators. Here, we compared the pressures exerted from humans, livestock, on tapirs and their natural predators, on a co-occurrence framework along the Andes of Colombia using camera trapping, we used multi-species occupancy modeling to quantify co-occurrence patterns among mountain tapir (*Tapirus pinchaque*), pumas (*Puma concolor*) and Andean bear (*Tremarctos ornatus*). We observed a strong spatial gradient across with higher co-occurrence in the northern portion of the central Andes. Co-occurrence patterns among tapirs and bears ranged from 0.15 to 0.39 and tapirs pumas ranged from 0.25 to 0.55 showing the highest levels of sympatry, in the middle part of the central Andes and decreasing to the southern Andes. We found that anthropogenic pressures, mainly by cattle ranching had the greatest effect in reducing sympatry among tapirs and bears more strongly than the distance to cities that also exhibited negative effects but in lesser degree. Human footprint, Andean bear showed positive effects on tapir puma co-occurrence. In a region of the world ongoing rapid socio-ecological change with increasing threats from climate and environmental instability, protected areas connecting the Amazon and the Andes play a major role in safeguarding wildlife and human livelihoods alike. Our findings highlight the need for effective interventions that focus on large areas of conservation, habitat restoration, and containment of livestock grazing to promote the coexistence of biodiversity and socio-economic goals within the region.

## **[PS2-3] Ten Years of Research on Tapir Movement and Ecology in the Maya Forest, Mexico**

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The Baird's tapir is an endangered species of the Neotropical Forest. The Maya Forest of southern Mexico holds one of the most important populations of the species. Tapir are solitary, shy, and nocturnal animals of which behavioral observations are very limited. Using radiotelemetry collars in two males that were captured in the Calakmul Biosphere Reserve

in 2011 and in 2022 we have found large home ranges on this species from 24 to 90 km<sup>2</sup> (using Minimum Convex Polygon and Autocorrelated Kernel Density Estimators). Apparently, these individuals frequently move long distances even up of 10 km in straight line to reach some water sources. We found also high fidelity to some specific ponds on these two individuals and other individuals that we were able to recognize due to some unique characteristics of the skin or face.

Additionally, using camera traps, we revised the social behavior of tapirs that are visiting ponds in the same reserve along 10 years. In these sites, locally named “aguadas”, and that are sites where social interaction may take place, we have found that tapirs are solitary animals, but dedicated some percentage of their time (13%) to socialize with other individuals and these associations can last for months, maybe years. We reported on individuals that have visited some specific sites for periods of 4 and 10 years. There is a male biased sex ratio among the individuals we could identify sexually, and tapirs are nocturnal most of the time, but preferences for early hours of the night was recorded. This is a unique study because it is the first time that movements patterns, social behavior, site fidelity, and sex ratio are presented for the species for several sites, and along 10 years. We hope to advance in the knowledge of the social and ranging behavior of this endangered species of the Neotropical forests.

#### **[PS2-4] Home Range Size and Habitat Use of the Endangered Baird's Tapir (*Tapirus bairdii*) in the Maya Forest Corridor, Belize**

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The Baird's tapir is the largest extant terrestrial mammal in Mesoamerica and considered an endangered species throughout its distribution range. Tapir populations have declined in the last 30 years by 50% due to natural rarity, habitat loss and fragmentation, overhunting and cattle-borne diseases. Despite its status, little is known about Baird's tapir spatial ecology, home range size, and habitat use. We monitored 3 radio-collared individuals ranging from 3 to 14 months of telemetry data in Runaway Creek Nature Reserve within the Maya Forest Corridor in central Belize. Our results show that the 3 tapirs from coastal central Belize had a preference for broadleaf forest at a fine scale (3rd Johnson's order of

selection) and pine savanna habitat at a broad scale (2nd Johnson's order of selection). Home range size ranged from 8 to 12 km<sup>2</sup>, with tapirs moving at an average of 4 km/day to fulfill their biological and ecological needs. During the dry season, water sources such as wetland, river, streams, and ponds became important areas for survival and the home range size and movement rate showed an increase when compared to the wet season. Apparently, larger space and faster movement rate is needed during the dry season to fulfill water and food requirements. Our results show that tapirs are thriving within the Maya Forest corridor and long term survival will depend on broadleaf forest and savanna protection and careful planning of land use and mitigation strategies for the prevention of tapir-vehicle collisions along the coastal road.

### **[PS2-5] Conserving a Flagship Species is an Effective Way to Connect Protected Areas: Integrated Evaluation of Baird's Tapir Habitat Use, Movement Patterns, and Landscape Connectivity in a Biological Corridor, Costa Rica**

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Baird's tapir (*Tapirus bairdii*) populations are primarily concentrated in protected areas across their distribution range. However, recent reports indicate an increase in tapirs wandering outside protected areas, especially in regions like the Tenorio-Miravalles Biological Corridor (TMBC) in Northwestern Costa Rica, known for its strong community-based conservation initiatives. Despite this, human-tapir conflicts arise due to tapirs raiding crops and tapir-vehicle collisions. In this study, we conducted an integrated evaluation of Baird's tapirs habitat use, movement patterns, and landscape connectivity at the TMBC. Our objectives were to 1) analyze camera trap data (June 2021 to July 2023) using hierarchical single-species spatial occupancy and activity pattern models, 2) assess individual home ranges using GPS radiocollar data with Kernel Density Estimators (KDE) and integrated Step Selection Functions (iSSFs), 3) map landscape connectivity using Omniscape.jl software, and 4) predict habitat suitability with maximum entropy modeling (MaxEnt). We found tapir detection correlated with sampling effort, increasing with higher effort. Occupancy was positively linked to forest cover but negatively impacted by pastures, indicating the influence of habitat fragmentation and livestock farming. Movement analysis revealed significant variations in home

range sizes and habitat selection preferences, with males favoring habitats near water bodies and roads, especially at night. Movement patterns showed that our individuals had a non-directional persistence except for one female, also step length decreased closer to roads for one female and for all males, while the effect of slope was negative for a female and positive for males. Interestingly, our results suggest that males moved more during the day. Landscape connectivity assessments reflected the corridor's status, while habitat suitability predictions underscored the importance of habitat quality and connectivity for the tapir population. This study represents a pioneering effort in investigating the space use, habitat selection, and movement patterns of Baird's tapirs within a biological corridor in Costa Rica using iSSFs. Our goal was to inform decision-making from the local governance and management plans of associated protected areas, and to propose an integrated framework that contains a toolset for an incentive market-based mechanism for Baird's tapir conservation at TMBC, that will further enhance human-tapir coexistence.

## **[PS2-6] The Way Home: Assessing Habitat Connectivity in the Central American Tapir**

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Habitat fragmentation and loss are two of the greatest threats to large mammals. This situation is clearly exemplified by the Central American Tapir (*Tapirus bairdii*), the largest terrestrial mammal in the neotropical region. Despite their ecological importance (e.g., as seed dispersers), their populations are seriously threatened in Mexico and Mesoamerica. In this study, we modeled habitat connectivity for tapirs in southeastern Mexico. Habitat identification was carried out by integrating the opinions of a group of experts on the Central American tapir, variables associated with its habitat and potential threats, and a distribution model of the species. We applied a spatial absorbing Markov chain (SAMC) framework to assess the habitat connectivity and connectivity metrics based on graph theory. Optimal habitat represents only 15.6% of the study area, of which 31% is under some form of protection in Mexico. We identified areas with high connectivity restrictions between tapir habitat fragments. The greatest connectivity restriction is located

between the habitat patches of the Sierra Madre de Chiapas and the Selva Zoque region, and between the Selva Lacandona and the northern highlands of Chiapas and Tabasco, becoming almost null between the Sierra Madre de Chiapas and the Lacandona. Tapir habitat in the Sierra Madre de Chiapas appears to be the most isolated. The Selva Zoque is key to maintaining the entire network of tapir habitat patches in southeastern Mexico. By combining different methodological approaches, it was possible to identify high quality habitat patches and perform a complete analysis of their connectivity. The derived information can provide a comprehensive overview of the long-term persistence of tapir populations, serve as a reference point to more effectively direct conservation efforts, tapir habitat restoration, and programs for the sustainable development of local communities in southeastern Mexico.

# PAPER SESSIONS

## PAPER SESSION 3 RESEARCH METHODS

Moderator: PATRÍCIA MEDICI

### **[PS3-1] Estimating Lowland Tapir Age through Dental Eruption and Wear**

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Age determination is a required information for a variety of research topics (i.e. social organization, modeling population viability, dispersal, health), as well as for the development of effective population management strategies. Moreover, the ability to assess tapir age is critical for GPS collar deployment, given the risk of collar constriction and injury. There is very limited literature available on the estimate of tapir age through dentition. Camera-trap data from the Pantanal and Cerrado biomes, Brazil, including age estimates through calf skin pattern at initial detection, alongside age estimates through dental photographs of tapirs captured and anesthetized for GPS tagging were applied on the development of a protocol. Key dental features were evaluated, including the differentiation between deciduous and permanent teeth, as well as the transition from deciduous to permanent dentition through observable eruption processes. The assessment of molar eruption also played a crucial role, given the absence of deciduous molars. Teeth wear was also evaluated, particularly focusing on the occlusal surface of inferior canines. Due to variations in the availability of good quality photographs depicting all teeth, classification into age classes relied on the most pertinent observations for each individual. As a result, tapirs were separated into distinct age classes: CALF (0-11 months) – from birth to incomplete eruption of the fourth upper premolar; JUVENILE (12-17 mos) – all deciduous teeth fully erupted – dental formula 2X (I3/3, C1/1, P4/3); SUB-ADULT 1 (18-23 mos): wear and dark stains in deciduous teeth becomes evident and the first molar begins to erupt; SUB-ADULT 2 (24-35 mos) – transition from deciduous to permanent teeth, typically starting at around 24 mos; first molar is present; SUB-ADULT 3 (36-47 mos) – continued transition from deciduous to permanent dentition, second molar

erupts, lower canines exhibit evident cusp wear; ADULT 1 (4-7 years) – lower canines show more evident signs of wear and dentin begins to appear, but there is no "dental star" yet; third molar appears; ADULT 2 (8-9 years) – visible signs of wear in the inferior canines, with evident dental star, pronounced wear on premolars and a discrete wear on the third molar appears; ADULT 3 (10-12 years) – yellowing of teeth and triangular shape of inferior canines due to wear; incisors show a dental star; ADULT 4 (13-14 years) – teeth may have dental calculus; lower canines are eroded and in a triangular shape; ADULT 5 (15-16 years) – wear in all teeth; upper incisors may have the same height; lower canines lack well-defined cusps; ADULT 6 (17-19 years) – erosion in the upper canines become evident; upper incisors may reach the same height as other incisors; ADULT-OLD (20 years or more) – wearing of posterior teeth at the gum line, potential tooth loss, and dental stars no longer visible in incisors and canines. These age classes provide a comprehensive framework for lowland tapir age estimation. Photos and detailed descriptions have been compiled by the Lowland Tapir Conservation Initiative (LTCI-IPÊ) in a document published in 2023 – PROTOCOL FOR AGE ESTIMATION OF LOWLAND TAPIRS BASED ON TEETH WEAR AND ERUPTION, a valuable tool for tapir researchers.

## **[PS3-2] Using stable isotopes to uncover lowland tapir resource use among Brazilian biomes**

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Variation in food resource use is an important factor in modulating intra-specific coexistence in a given area. Availability of food resources varies among different vegetation types and in response to habitat quality, which is directly and indirectly affected by habitat loss and fragmentation. Therefore, organisms' resource use differences are expected between natural and human-modified landscapes, resulting in changes in their dietary niche. Moreover, organisms tend to feed on non-preferred items when preferred ones are scarce or limited, which might alter the size of their niches. Here, we evaluated intra-specific variation in food resource use of lowland tapirs (*Tapirus terrestris*) among four Brazilian biomes and an ecotone

zone using stable carbon and nitrogen isotopes. We collected hair samples from 93 individuals (Atlantic Forest=13, Amazon=20, Pantanal=20, Cerrado=20, Cerrado/Amazon ecotone=20), and compared isotopic values within populations and among biomes using descriptive and multivariate statistics, parametric and non-parametric tests, and isotopic niche analysis, besides estimating the dietary preferences of individuals (C3, C4, and mixed diets). Tapir populations were isotopically different among biomes, with a higher similarity between Cerrado and Cerrado/Amazon ecotone, and with the Pantanal. Except for the Amazon, where half of the individuals surprisingly presented mixed diets (i.e., incorporating C4 plants), tapirs fed exclusively on forest resources (C3 diets) in all biomes. Concerning nitrogen, a wide variation was observed in all biomes, indicating a varied use of food resources, but overall similar to the isotopic values of the native vegetation in each biome. The smallest isotopic niches (i.e., a representation of the dietary niche) were observed for tapirs in the Atlantic Forest and Pantanal, indicating individuals with more specialized diets. Conversely, tapirs in the Amazon and Amazon/Cerrado ecotone showed larger niches, showing more variation in their diets, especially in the Amazon, where individuals used forest and non-forest resources. We showed that tapirs' diet varied in response among biomes, but are possibly influenced by anthropogenic pressures. Surprisingly, although the Atlantic Forest and Cerrado landscapes are more affected by habitat loss, fragmentation, and other anthropogenic stressors, the consumption of non-forest resources (C4 plants) was detected in the Amazon. This might result from the advancing degradation of this biome in the Deforestation Arc, which replaces native vegetation with agriculture and pastures, potentially influencing tapirs' diet.

### **[PS3-3] Implications of the Scale of Detection for Inferring Species Co-Occurrence Patterns from Paired Camera Traps and Acoustic Recorders**

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Multifunctional landscapes that support economic activities and conservation of biological diversity (e.g., cattle ranches with native forest) are becoming increasingly important because small remnants of native forest may comprise the only habitat left for some wildlife species. Understanding the co-occurrence between wildlife and disturbance factors, such as poaching activity and domesticated ungulates, is key to successful management of multifunctional landscapes. Tools to measure co-occurrence between wildlife and disturbance factors include camera traps and autonomous acoustic recording units. We paired 52 camera-trap stations with acoustic recorders to investigate the association between 2 measures of disturbance (poaching and cattle) and wild ungulates present in multifunctional landscapes of the Colombian Orinoquía. We used joint species distribution models to investigate species–habitat associations and species–disturbance correlations. One model

was fitted using camera-trap data to detect wild ungulates and disturbance factors, and a second model was fitted after replacing camera-trap detections of disturbance factors with their corresponding acoustic detections. The direction, significance, and precision of the effect of covariates depended on the sampling method used for disturbance factors. Acoustic monitoring typically resulted in more precise estimates of the effects of covariates and of species–disturbance correlations. Association patterns between wildlife and disturbance factors were found only when disturbance was detected by acoustic recorders. Camera traps allowed us to detect nonvocalizing species, whereas audio recording devices increased detection of disturbance factors leading to more precise estimates of co-occurrence patterns. The collared peccary (*Pecari tajacu*), lowland tapir (*Tapirus terrestris*), and white-tailed deer (*Odocoileus virginianus*) co-occurred with disturbance factors and are conservation priorities due to the greater risk of poaching or disease transmission from cattle.

### **[PS3-4] Comparison between Dexmedetomidine and Medetomidine for Chemical Immobilization of Lowland Tapirs (*Tapirus terrestris*) in the Pantanal**

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Alpha2-adrenergic agonists, such as dexmedetomidine (DEX), medetomidine (MED), and xylazine, are potent sedative-hypnotics that promote muscle relaxation and variable analgesia. The aim of this study was to compare the effects on physiological parameters of Pantanal tapirs using DEX and MED, with eight individuals in each group, using the box-trap capture method. The protocol adopted consisted of the combination of Butorphanol 0.15 mg/kg and Ketamine 0.6 mg/kg with Medetomidine 0.012 mg/kg (MED Group) or Dexmedetomidine 0.006 mg/kg (DEX Group). The weights of the individuals ranged from 100 to 200 kg, and the doses were calculated based on estimated weights. The evaluated parameters included heart rate (HR), respiratory rate (RR), oxygen saturation (SpO<sub>2</sub>), and rectal temperature (RT), recorded every 10 minutes throughout the procedure. The statistical method used was the student's t-test. The sedation time (T<sub>0</sub> to recumbency) averaged four minutes (±1.59) for DEX and three minutes (±1.03) for MED. Although there was a slight difference in the meantime to recumbency between the groups, this difference was not significant (t = 1.49; p=0.08). The mean physiological parameters for

the DEX group were: HR = 47 ( $\pm 6.44$ ) bpm; RR = 22 ( $\pm 3.24$ ) breaths/min; SpO<sub>2</sub> = 87 ( $\pm 3.09$ ) %; and RT 35.3 ( $\pm 0.84$ ) °C. And for the MED group: HR = 54 ( $\pm 5.08$ ) bpm; RR = 25 ( $\pm 9.25$ ) breaths/min; SpO<sub>2</sub> = 88 ( $\pm 5.16$ ) %; and RT 35.7 ( $\pm 1.72$ ) °C. The analysis results revealed significantly lower HR values in the DEX group ( $t = -2.415$ ;  $p = 0.029$ ). There was no significant difference between the groups in the other parameters: RR ( $t = -0.866$ ;  $p = 0.401$ ); SpO<sub>2</sub> ( $t = -0.47$ ;  $p = 0.644$ ); RT ( $t = -0.562$ ;  $p = 0.581$ ). In the MED group, five individuals presented different adverse effects during anesthesia: (1) gastric reflux, (1) sialorrhea, (2) urination, and (1) penile relaxation. In the DEX group, six animals presented some type of nasal secretion during the anesthetic procedures. In both groups, after the procedure, Naltrexone 0.3 mg/kg and Atipamezole 0.06 mg/kg were used as reversers. Regarding recovery time (from antagonist application to standing), the average in the DEX group was 2 minutes ( $\pm 0.7$ ) and in the MED group was 4 minutes ( $\pm 5.84$ ). There was no significant difference in recovery time between the groups ( $t = -0.959$ ;  $p = 0.355$ ). Our results indicate that DEX induces sedative effects comparable to MED with only half the dose while maintaining comparable physiological parameters. These findings corroborate previous studies in other species. The efficacy of DEX stems from its higher affinity for alpha-2 adrenergic receptors, giving it greater potency compared to MED. We observed a significant reduction in heart rate (HR) with DEX, presumably due to its greater potency. Despite the lower values compared to the group treated with MED, HR values remained clinically stable, not resulting in bradycardia. Therefore, we conclude that both protocols are safe for anesthesia in tapirs in the wild, with DEX being a viable alternative to MED, providing similar chemical restraint with half the dose.

# PAPER SESSIONS

## PAPER SESSION 4

### TAPIR HEALTH & REPRODUCTION

Moderator: BUDHAN PUKAZHENTHI

#### **[PS4-1] Mountain Tapir Health Assessments in the Wild and in Zoos**

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Mountain tapir, the smallest and most critically endangered of the tapir species, are predominantly found in cloud forests of Colombia, Ecuador, and Peru. Their populations are decreasing, with an estimated 2,500 individuals remaining in the wild and only six tapir remaining in zoos world-wide. In the wild, mountain tapir are impacted by habitat loss and habitat fragmentation, but also may have health impacts from their interface with agriculture and livestock disease. In zoos, mountain tapir have had low reproductive success and other health concerns include apparent elevations in levels of iron in their blood. As part of a long term study on health and habitat use of mountain tapir in Ecuador, a team lead by the Andean Bear Foundation has done health assessments on free ranging mountain tapir. This presentation will highlight preliminary results that suggest health differences between the two groups of tapirs and discuss potential implications both for conserving wild mountain tapir and for potential husbandry changes in the zoo population.

#### **[PS4-2] Study of Mortality Causes in the Malayan Tapir EEP - EAZA Ex-Situ Programme - for the last 12 years**

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The Malayan tapir (*Tapirus indicus*) occurs in southern and central parts of Sumatra and on the Asian mainland in Peninsular Malaysia, Thailand and Myanmar. The

species is listed as endangered by the IUCN Red List (2016). The EEP population currently consists of 63 animals (29 males and 34 females) but only 46 in Europe, and really needs to grow up, to reach its goal of insurance population.

However, unlike the captive population of lowland tapirs (*Tapirus terrestris*), this population remains very fragile and has failed to increase during the last 30 years, despite the overall progress made by zoos these recent years.

In order to understand why this population didn't succeed to increase in Europe, a questionnaire has been sent to holders to study the mortality causes of the 63 Malayan tapirs that died in Europe and in 2 other South-East Asian zoos (included in the EEP) since 2011. The questionnaire asked holders about the identified causes of death, additional examinations carried out, intercurrent illnesses and specific other zootechnical parameters. Holders were also asked to provide all necropsy and tests reports relating to these deaths and to share medical records on ZIMS Species 360.

Analysis of the responses and received documents enabled us to establish the main causes of mortality, studying them by age and sex categories, types of organs and pathogens, revealing the weak points of this species. Following this review, we need to look at the zootechnical parameters applied to the Malayan tapir under human care, focusing on the diets provided and the preventive medicine to be implemented. Recommendations will be then incorporated into the EAZA Best Practices Guidelines, which are currently being drawn up for this species. Finally, in the near future, this study will be extended to the North American population in order to provide a better overview of the mortality causes for this endangered and secretive species.

### **[PS4-3] Prevalence of Infectious Agents in Lowland Tapir Populations: A Comparison among the Atlantic Forest, Pantanal, and Cerrado Biomes, Brazil**

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Health surveillance plays an underlying role in the conservation of lowland tapirs by enabling early disease detection and implementation of preventive measures. The monitoring of infectious agents prevalence in tapir populations across the Atlantic Forest (AF), Pantanal (PA), and Cerrado (CE) biomes is a continuous effort of the Lowland Tapir Conservation Initiative (LTCI-IPÊ). While the AF study site is a protected area and the PA site is under less anthropogenic

influence, the CE site is composed of fragmented forest remnants where tapirs face a number of threats and drastic changes in their natural habitat. A total of 35 individuals were captured and sampled in the AF, 30 in the PA, and 35 in the CE. Serological analyses were conducted to detect the presence of antibodies against relevant infectious agents, particularly *Leptospira interrogans*, bluetongue virus (BTV), eastern and western equine encephalitis virus (EEE and WEE), and porcine parvovirus. Statistical analysis of prevalence (95% CI) was performed to compare exposure rates between biomes. In the AF, the prevalence of *Leptospira interrogans* was 25%; EEE and WEE had prevalence of 18.7% and 3.1%, respectively; BTV was 15.6%. In the PA, the prevalence of *Leptospira interrogans* reached 75%; porcine parvovirus was 100%; and a low prevalence of antibodies against BTV was observed (2.8%). In the CE, the prevalence of *Leptospira interrogans* was 60%; BTV was 91%, and 97% for porcine parvovirus. *Leptospira interrogans* Pomona was the only serovar found in all populations. The results reveal significant differences in pathogen prevalence among study sites. In the PA, the high prevalence of *L. interrogans*, with a diversity of serovars identified, suggests intense exposure, indicating a complex ecology of leptospirosis transmission. This biome is characterized by flooded areas, an ideal environment for the survival and dissemination of these bacteria, while in the AF the prevalence is lower probably due to a less favorable environment. In the CE, the high prevalence of *L. interrogans* may be related to their overall poor health conditions, turning this population more susceptible to pathogenic agents. Further investigation is needed to understand if tapirs are reservoirs for leptospirosis, especially for leptospirosis serovar Pomona, since antibodies were detected in all biomes despite the absence of clinical signs. The detection of porcine parvovirus with high prevalence in the PA and CE, while no antibodies against this agent were found in the AF, highlights the potential role of feral pigs as reservoirs of pathogens in these areas. The high prevalence of exposure to BTV found in the CE, while modest prevalence was found in the AF and PA, was probably related to environmental variables that favored insect survival and virus spread conditions. The detection EEE and WEE viruses only in the AF suggests significant exposure to these agents at this study site, the presence of birds and mosquitoes (Culicidae family), key factors for this disease cycle, is evident. Sanitary surveillance contributes to a better understanding of the interactions between animal species, pathogens, and the environment, guiding proper conservation efforts.

## **[PS4-4] Results on Physical Examinations in Lowland Tapirs (*Tapirus terrestris*) across Four Brazilian Biomes**

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Lowland tapirs (*Tapirus terrestris*) face increasing threats that may compromise their health and survival. This study aims to assess tapir health in four Brazilian biomes – Amazon, Atlantic Forest, Cerrado, and Pantanal – exploring differences in clinical findings during capture procedures for GPS tagging. To achieve these objectives, comprehensive physical examinations were conducted, including: overall body condition, integrity of fur and skin, examination of anatomical cavities, palpation and auscultation for evaluation of internal organs and musculoskeletal system, condition of nails and foot pads and reproductive assessment. In the Atlantic Forest, 35 tapirs were evaluated, 30 in the Pantanal, 17 in the Amazon, and 35 in the Cerrado. In the Atlantic Forest, the majority of tapirs (77%) were considered to be in good body condition during physical examinations. Anomalies in fur were observed in 7% of cases, while scars or wounds on the skin were identified in 34% of tapirs. Unilateral corneal lesions were seen in 4% of the animals, and 9% exhibited senile halo. Genital abnormalities were observed in 2% of females. Fractures in the incisors were detected in 5% of cases during dental examinations. In the Pantanal, 30 tapirs were evaluated, and the majority (75%) were considered to be in good body condition. About half (47%) of the tapirs exhibited recent scars or wounds on the skin, and a small proportion (2%) showed phlegmon. Regarding ocular conditions, a minority (3%) exhibited senile halo, while another small group (2%) showed bilateral opacity of the lens. Only 2% of the females had abnormal vaginal secretion in the genital organs. During dental examinations, no fractures were observed in the incisors.

In the Amazon, where study sites are located along the southern arc of deforestation, the most significant alterations observed were: five animals (29%) presented dark spots on the gums and palate, while seven animals (41%) showed hoof abnormalities with "stress lines". In the Cerrado, tapirs displayed a high prevalence of dental problems (57%), possibly associated with the quality of available food resources, since they are observed ingesting corn and other monocultures as soybean. Additionally, 34% presented wounds, mainly associated with traumatic events and inflammatory processes. These findings underscore the importance

of considering the specific contexts of each biome when assessing tapir health. Both in the Atlantic Forest and in the Pantanal, tapirs exhibited physical anomalies associated mainly with age and social interactions, such as dental wear and scars from conflicts. Nevertheless, the physical assessment indicated a good body condition in both populations, suggesting that tapirs remain healthy despite social challenges and potential predatory pressures. The Atlantic Forest and the Pantanal offer more favorable conditions due to less anthropized ecosystems, while the Amazon and the Cerrado face unique challenges due to intense agricultural activity and habitat fragmentation. The detection of pesticide contamination highlights the need for stricter environmental policies. Tapirs in these biomes face challenges such as vehicle collisions and habitat loss. Thus, the conservation of natural habitats is essential to ensure the health of tapir populations and the ecosystems.

### **[PS4-5] Hematological and Biochemical Parameters of Lowland Tapirs (*Tapirus terrestris*) Captured in the Amazon**

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The evaluation of the health of the lowland tapir (*Tapirus terrestris*) in its wild habitat requires a comprehensive analysis of hematological and biochemical parameters, to detect metabolic disorders and systemic diseases early. Thus, the study of clinical pathology can be used to identify patterns of population health, and not just individual. In the present study, the description of hematological and serum biochemistry reference values was performed for 30 individuals (16 males and 14 females) captured in the southern arc of deforestation, in the Amazon. The results of descriptive statistics (mean  $\pm$  standard deviation) obtained were: red blood cells: (5.07  $\pm$  0.92) (million/mm<sup>3</sup>); hematocrit: (29.9  $\pm$  3.32) (%); MCV/MCH: (60.5  $\pm$  13.30) (fL). Leukocytes: total leukocytes: (8,476.66  $\pm$  2,413.81) (cells/mm<sup>3</sup>); neutrophils: (51.16  $\pm$  15.88) (%); band cells: (0.1  $\pm$  0.30) (%); segmented cells: (42.43  $\pm$  19.34) (%); lymphocytes: (36.43  $\pm$  13.97) (%); monocytes: (0.56  $\pm$  0.72) (%); eosinophils: (11.8  $\pm$  7.54) (%); platelets: (398,000  $\pm$  203,675.42) (thousand/mm<sup>3</sup>). Biochemical parameters: glucose: (128.83  $\pm$  32.62) mg/dL; total cholesterol: (119.36  $\pm$  17.83) mg/dL; HDL cholesterol: (61.83  $\pm$  11.16) mg/dL; LDL cholesterol: (51.4  $\pm$  15.45) mg/dL; VLDL cholesterol: (6.13  $\pm$  2.70) mg/dL; triglycerides: (31.16  $\pm$  13.10) mg/dL; urea: (16.93  $\pm$  8.21) mg/dL; creatinine: (1.09  $\pm$  0.23) mg/dL; uric acid: (0.1  $\pm$  4.23); total proteins: (6.91  $\pm$  0.47) g/dL; albumin: (3.37  $\pm$  0.30) g/dL; globulin: (3.53  $\pm$  0.54) g/dL; albumin/globulin ratio: (0.98  $\pm$  0.21); ALT (Alanine Aminotransferase):

(7.1 ± 7.43) U/L; AST (Aspartate Aminotransferase): (72.8 ± 23.24) U/L; total bilirubin: (0.16 ± 0.16) mg/dL; direct bilirubin: (0.06 ± 0.10) mg/dL; indirect bilirubin: (0.12 ± 0.13) mg/dL; Gamma-GT: (12.56 ± 6.02) U/L; lactate dehydrogenase: (604.2 ± 112.26) U/L; Magnesium: (2.31 ± 0.47) mg/dL; ionic Calcium: (1.22 ± 0.06) mmol/L; Calcium: (10.61 ± 0.59) mg/dL; Phosphorus: (3.82 ± 0.99) mg/dL; Ratio: (2.99 ± 0.97); Potassium: (4.85 ± 0.83) mmol/L; Sodium: (134.36 ± 4.61) mmol/L; alkaline phosphatase: (13.4 ± 6.63) U/L; Iron: (113.53 ± 54.06) mcg/dL; plasma cholinesterase: (205.27 ± 369.85) U/L; erythrocyte cholinesterase: (228.16 ± 682.43) U/L; creatine phosphokinase (CK/CPK): (127.46 ± 52.56) U/L; Chlorine (99.83 ± 2.82) mEq/L. This study is the first to present hematological values of free-living tapirs in the Amazon. Hematological values were similar to those indicated by ISIS reference ranges. Hematological values in the Amazon are similar to those in the Pantanal for most parameters. As for serum biochemistry, urea and creatinine values in the Amazon are higher than in the Pantanal, potentially indicating possible renal disorders in the population, which could be due to greater exposure to toxic agents, also considering that tapirs in the Amazon were sampled in regions with intense anthropic activity, in the southern arc of deforestation. Glucose, cholesterol, and triglyceride values were lower in the Amazon, reflecting possible variations in diet, or possible impairment of hepatic metabolism. Considering these differences between populations can help understand physiological adaptations and identify population health issues. Thus, the study of clinical pathology in free-living wildlife has important potential in the field of conservation medicine.

## **[PS4-6] Exposure of Humans and Wildlife to Pesticides and Metals in the Cerrado Biome, Mato Grosso do Sul, Brazil**

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During the period spanning 2015 and 2018, a study carried out by the Lowland Tapir Conservation Initiative (LTCI) – Institute for Ecological Research (IPE), delved into the impacts of pesticide and metal exposure on lowland tapir (*Tapirus terrestris*) population in fragments of Cerrado in the municipalities of Nova Alvorada do Sul and Nova Andradina in Mato Grosso do Sul state, Brazil.

This state of Mato Grosso do Sul is renowned as one of the foremost consumers of agrochemicals globally. The research outcomes revealed the presence of nine agrochemicals (diazinon, mevinfos, malathion, dichlorvos, dimethoate, aldicarb, carbaryl, deltamethrin, and permethrin) and four metals (cadmium, copper, iron, manganese) within biological samples collected from 116 wild tapirs (captured live for GPS tagging, and tapirs killed in vehicle collisions along highways). These results raised concerns about a potential contamination not solely limited to wildlife but also extending to human populations cohabiting the same area. In response to these concerns, the LTCl broadened its research scope to encompass local people living where contaminated tapirs had been previously identified. In April 2023, after approval from a Brazilian Ethics Committee and upon completion of an Informed Consent Form, 94 people were sampled (blood and/or urine) in order to assess contamination levels by pesticides and metals. Participants were predominantly rural workers, with ages ranging from 19-73 years old. In addition to biological samples, participants underwent a detailed interview about their housing arrangements, occupation, and health status, allowing for a comprehensive analysis of levels of exposure to agrochemicals and metals. Their bloodwork revealed several deviations, including anemia, eosinophilia, and hemoconcentration, whereas biochemical analysis exhibited variances across parameters such as ferritin, GPT (glutamic-pyruvic transaminase), and C-reactive protein. Urine exams detected crystals, calcium oxalate, uric acid, phosphate, urate, and nitrite. The Toxicology Assistance Unit (CIATOX) from UNESP Botucatu (São Paulo, Brazil) was responsible for quantifying 35 toxic substances, including nine metals, 10 organophosphates, and 16 organochlorines. The Evandro Chagas Institute, located in Pará state, also in Brazil, conducted glyphosate quantification through urine samples. The outcomes of these evaluations included the detection of seven different substances: two organophosphates (glyphosate and malathion), three organochlorines (pp'DDD, dieldrin, and beta-BHC), and two metals (copper, and mercury). These findings highlight the extensive contamination by agrochemicals and metals not solely restricted to wildlife (lowland tapirs), but also in human communities sharing the same environment in the Cerrado biome of Mato Grosso do Sul, Brazil. The concerted efforts outlined here aim to inform policy adjustments relevant to the use and oversight of agrochemicals within Brazil. With these results, the LTCl aims to inform and change public policies, seeking to protect both wildlife and vulnerable human populations from contamination, while also preserving natural environments, in alignment with the principles of global health.

## **[PS4-7] An Update on Tapir Reproduction and Assisted Reproductive Technologies**

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Tapirs (*Tapirus sp.*) have been extensively studied in the wild and the new knowledge generated has led to the development of effective conservation programs around the world. In contrast, there has been limited research on ex situ managed tapirs primarily due to a lack of access to these animals. Unfortunately, all four species of tapirs are not self-sustaining because of low number of founders, specialized exhibit needs, behavioral incompatibility, and decreased reproductive output. Assisted reproductive technologies including semen cryopreservation and artificial insemination could improve genetic management and minimize the risks associated with transport of live animals for breeding. Further, development of methodologies for semen collection and cryopreservation could lead to the establishment of sperm banks for tapirs. This presentation will summarize 1) our current understanding of the fundamental reproductive biology of tapirs, 2) state-of-the-art of assisted reproductive technologies, and 3) identify high priority research needs to improve genetic management and reproductive success in ex situ managed tapirs.

# PAPER SESSIONS

## PAPER SESSION 5

### TAPIR GENETICS

Moderator: GABRIELA MEDEIROS DE PINHO

#### [PS5-1] Evolution, Biogeography and Genetics of Living Tapirs

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Tapirs are among the oldest living large mammals, represented by only four widely recognized extant species. This presentation will highlight the main topics touched by the first chapter of the book “Tapirs of the World: Ecology, Behaviour and Conservation”, that will be published in the next few months by Springer Nature, and has Mario Melletti, Rafael Reyna-Hurtado and Patricia Medici as editors. This chapter reviews published research that uses genetic tools to study the phylogenetic relationships among tapir species and genetic intraspecific population patterns. We compare genetic diversity among species both in nature and captivity, discuss the limitations of published studies, and make recommendations for future research. The phylogeny of the genus *Tapirus* is mostly well established, with the exception of studies that disagree in divergence time estimates, questions raised about the relationship between the mountain and lowland tapirs (*Tapirus pinchaque* and *Tapirus terrestris*, respectively), and the uncertain taxonomic status of the kabomani tapir (described as *Tapirus kabomani*). Although sample sizes, genetic markers, and the number of studies vary among species, a trend can be observed from both microsatellite and mitochondrial markers: the lowland tapir has the highest genetic diversity, followed by the mountain tapir, the Baird’s tapir (*Tapirus bairdii*), and at last, the Malayan tapir (*Tapirus indicus*). Overall, molecular tools have been insufficiently used by tapir researchers. Tapir phylogeography information has been generated from few mitochondrial markers, and many lacked power to define lineages. Studies using next generation sequencing are needed to improve knowledge about tapir diversification and conservation status. Genomic data, such as whole genome assemblies, are publicly available for most tapir species, but have not been used for population, phylogenetic or

phylogeographic studies. Only a few genetic studies have aided tapir ex situ management or used genetic information from captive individuals to study tapir wild lineages (captive tapirs of known geographic origin can provide data from their original populations). Most studies lack a well-balanced number of samples across study areas, which is not surprising due to the difficulty to acquire tapir samples. Thus, efforts to collect and archive tapir samples are crucial for the future of tapir genetic research.

## **[PS5-2] Lowland Tapir Genetics in Brazil**

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Genetic tools can have a strong impact in conservation initiatives, generating knowledge difficult to access by other methods. This presentation aims to inform tapir conservationists about the current initiatives that use genetics to study the lowland tapir (*Tapirus terrestris*) in Brazil, and exemplify the use of their current and future potential results. A large-scale genetic study is led by the Lowland Tapir Conservation Initiative (LTCI), that collects biological samples from live-trapping and carcasses since 1996, and has samples from all Brazilian biomes where lowland tapirs occur: Atlantic Forest, Cerrado, Pantanal and Amazon. The genetic front within LTCI officially started in 2022 with two main goals: to estimate the relatedness among monitored individuals and to unveil population genetic patterns in the Brazilian biomes. The LTCI uses relatedness among tapirs to complement information generated with camera traps and radio collars, which has been improving knowledge about the lowland tapir social and reproductive behavior, dispersal and spatial ecology. The population genetic study branches into two approaches: the first takes the opportunity of the data initially collected to estimate individual relationships (microsatellite data), and the second explores tapir genomes through whole genome sequencing as part of the consortium Genomics of the Brazilian Biodiversity (GBB). Both approaches bring important information for the conservation of tapir populations, including the number of populations, the genetic diversity of each population, and how/if they are connected. The genomic approach

goes beyond by potentially identifying local adaptations and providing more detailed estimates in general. Another tapir genetic project is being developed by the Large Mammals Conservation Program (LMCP, Manaca Institute) in the Atlantic Forest, which investigates whether the recent increase in tapir albinism frequency is a result of low genetic diversity and inbreeding. The LMCP and LTCI are also joining forces to increase the geographical distribution of tapir samples in Brazil for the population genetic investigation. The studies developed by both LMCP and LTCI are in partnership with the Laboratory of Molecular Biodiversity and Conservation, at the Federal University of São Carlos. Additionally, the Refauna Project has been studying the genetic diversity of reintroduced tapirs in the Atlantic Forest, and used a mitochondrial marker to estimate which lineage these previously captive tapirs came from. We will discuss the current available results from these projects and how genetic information can aid decision making within tapir conservation projects.

### **[PS5-3] Gut Microbiome, MHC, and Odor in Tapirs Towards Improving Captive Breeding and Reintroduction to Wild**

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Health and welfare of tapirs kept away from the original habitats (especially under captive condition) is subjected to alterations in gut microbiome due to exposure to contrary changes of living environments and sub-optimal nutrition (e.g., foods), following translocations within or between countries (e.g., changes in climate, surrounding biota). Gut microbiome is important to digestion and nutrition and therefore its alterations can affect host health in mammals. Major histocompatibility complex (MHC), a set of host genes that mediates adaptive immune responses, can shaped the microbial structure too; microbial diversity is either negatively or positively correlated with MHC diversity. Both gut microbiome and MHC has been suggested as possible factors influencing the volatile composition in odor that contains chemical signals which convey information on individual's genetic variation or fitness. In particular, MHC-mediated mate choice has been demonstrated in many vertebrate species, and MHC molecule-binding peptides were suggested as the info-chemicals sought after. Therefore, we speculate that tapir mate choice may also be mediated by MHC diversity through odor and stimulation of olfactory senses by MHC-associated peptides. The links between gut microbiome, MHC, and odor has rarely been investigated together in a mate choice study, neither in tapir species even in each standalone topic. In this proposed research, we would like to address a few questions such as: How gut microbiome in tapirs are affected by changes in diet and translocations including between captive and wild? Is and how tapir mate choice mediated through the interplay of MHC, gut

microbiome and odor? What info-chemicals serve to transmit MHC variation signals if tapir mate choice is MHC-mediated? We will use DNA sequencing strategies (Illumina or Oxford Nanopore Technology platforms) to perform diet and gut microbiome analysis from feces, and MHC typing from blood/tissue. Urine will be used to extract peptide content via gas/liquid chromatography mass spectrometry. Mate choice experiment will be performed in captive tapirs from Japan, Malaysia and Brazil, for both Malayan and lowland tapirs. Our research aims to understand the differences in diet and gut microbiome between captive and wild tapir populations to provide insights for improving the diet of captive tapirs for better health management, as well as insights on risks of inbreeding and reduced fitness and adaptability due to reducing MHC diversity. These components are important also for assessing tapir reintroduction. Furthermore, limited mate choice if not deprived of freedom to choose, are potential issues that can impact the overall health and welfare of animals in captivity. Through the understanding of mate choice system in tapirs, we hope individual odor may be used in a mate selection test in future breeding programme prior to physical translocations, which can potentially minimize stress to tapirs as well as translocation cost.

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# WORKSHOPS

## WORKSHOP 1 TAPIR REINTRODUCTION

Moderator: MARON GALLIEZ

### **[W1-1] Reintroduction of Lowland Tapirs (*Tapirus terrestris*) in the Province of Tucumán, Argentina**

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Tucumán is the smallest province in Argentina, but also the most densely populated and industrialized in the Argentine Northwest. Four large ecoregions are represented, giving a high landscape, climate and biological diversity. The transformation and modification of the province's habitats resulted in the extinction of numerous species, including the lowland tapir. In the Horco Molle Experimental Reserve (REHM), of the Faculty of Natural Sciences of the Universidad Nacional de Tucumán (UNT), a tapir reintroduction project is being developed, which involves university institutions, NGOs and the Tucumán's government. For this project, satellite tracking collars were developed at the UNT and a reintroduction trial was carried out with the release of two females in the UNT's "Sierra de San Javier" Park of 14.000 ha. While the tapirs adapted well to their new habitat, unfortunately one of them was hunted, outside the park, two months later. This forced to restructure the project, giving greater impetus to aspects linked to work with local communities, adding social psychologists to work alongside the project's environmental educators. We also joined the Proyungas Foundation, with experience in working with private companies. Many of these companies own privately managed protected and productive areas (Protected Productive Landscapes). This private conservation model, together with provincial and national protected areas, come together to form the Aconquija Protected Landscape (APL). The main objective of our project is to create a population nucleus between 20 to 30 tapirs into one of the Protected Productive Landscapes (PPL), with the capacity to disperse within the APL. For that, we held an event to communicate the project to businessmen and owners of PPL, to invite them to add their protected areas to the project. It is expected in this way to contribute to the recovery of the tapir in the country and the province and, through the reintroduction of a key species of the Yungas ecosystem and thus favor the conservation of the structure and richness of the typical forests of this ecoregion.

The project is an excellent opportunity to link companies concerned about the environment and integrate tourism, production and nature conservation. We hope that the project will help generate economic resources for local populations, through an increase in ecotourism in the areas to be repopulated. The introduction of a population of tapirs in the APL constitutes a unique event in the NOA and of great significance. It which would allow the cooperation between university, landowners and local government in the reestablishment of ecological processes associated with this species, generate tourist opportunities, disseminate the problem of the tapir in society, recover an extinct species in the province and improve the chances of long-term survival of this and other associated species (umbrella effect).

## **[W1-2] Reintroduction of Lowland Tapirs, *Tapirus terrestris*, in the Atlantic Forest, Brazil**

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An important conservation strategy for threatened species involves the translocation of animals into their historical ranges. This strategy allows for the establishment of new populations and the restoration of the ecological roles of the species in the area. Lowland tapir (*Tapirus terrestris*) has a wide distribution, but it has become extinct in different areas, including in parts of the Atlantic Forest biome. The last recorded sighting in Rio de Janeiro, Brazil, was in 1914. Therefore, Refauna initiated a project to reintroduce lowland tapir to the Atlantic Forest of Rio de Janeiro in 2017. Here, we describe the first six years of the project. We transported 22 tapirs (11 males and 11 females) from nine ex-situ institutions between December 2017 and December 2023. Tapirs were transported to acclimatization pens built in Guapiaçu Ecological Reserve, a 10,000-ha private protected area within the Central Rio de Janeiro Atlantic Forest Mosaic. During acclimatization, tapirs received supplementary food and had access to a river or a lake, as well as shelter, allowing them to adjust to the new environmental conditions and food resources before release. Tapirs were anesthetized to conduct biometric measurements, to fit telemetry collar and apply microchips and numbered ear tags. Dialogue activities were initiated in the region two years before the first tapirs were released to minimize the risk of conflict between reintroduced tapirs and local community. Since the first release in March 2018, six calves have been born in the wild, but eight of the translocated tapirs have died. The overall survival rate of translocated tapirs was 0.636; however, after the first year in the wild, the survival rate rose to 0.875. The home range of released tapirs was  $1.32 \pm 0.97 \text{ km}^2$  (KDE 95%) and the traveled distance was  $1.59 \pm 0.45$

km daily during the initial period of reintroduction. Sex and origin didn't affect the survival rate or the spatial patterns. Daily movement distances were smaller for tapirs released in areas where no individuals were previously established ( $1.32 \pm 0.55$  km/day) compared to tapirs released in areas with other established tapirs ( $2.06 \pm 1.10$  km/day). In both cases, tapirs moved close to the acclimatization pen during the first 90 days after release ( $512.1 \pm 890.7$  m). The community's reception to the dialogue activities was positive. Many local people believe that the chance to encounter a tapir could stimulate tourism. Despite all actions, conflicts still arose. Initially, some tapirs persisted in approaching houses and crops in search of food. The most effective strategy for deterring tapirs was the use of electric cattle prods. Presently, most tapirs hardly accept any approximation. The tapir reintroduction project in Rio de Janeiro is currently ongoing and requires the release of more tapirs and measures to enhance tapir survival shortly after the release in order to achieve a self-sustainable population. The release of tapirs in multiple sites in the area has proven to be an effective strategy.

### **[W1-3] Spatial and Activity Patterns of Reintroduced Lowland Tapirs (*Tapirus terrestris*) in the Atlantic Forest**

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Fauna reintroduction has been used to restore ecosystems by establishing new populations of species that were locally extinct. In this strategy, it is possible to use wild or captive animals. Although the use of captive animals is convenient, but these animals may exhibit stereotypical behaviors. Between December 2017 and December 2023, Refauna reintroduced 22 lowland tapirs (*Tapirus terrestris*) in the Atlantic Forest of Rio de Janeiro state, Brazil. Captive animals were utilized, employing the strategy of soft release. In this study, our aim was to analyze the spatial and activity patterns of reintroduced lowland tapirs in the Atlantic Forest. We tested the effects of tapir origin, sex, and time after release on both spatial and activity patterns. During acclimatization and after release, tapirs were monitored by camera traps. Additionally, after release, tapirs were monitored using telemetry collars. Activity patterns were analyzed using circular Kernel methods, and the Mardia-Watson-Wheeler test was employed to verify the effects of sex and acclimatization-released on tapir activity.

There was a difference in activity patterns during the acclimatization period and after release, with an overlap of 88%. However, there was no difference between the

activity patterns of males and females. Tapirs decreased their proportion of diurnal activity and increased activity during the night and twilight.

Tapir home range was  $1.32 \pm 0.97 \text{ km}^2$  (KUD95%) and the core area was  $0.28 \pm 0.54 \text{ km}^2$  (KUD50%). The male Antibes had the largest home range and intensive use area, while the female Flora had the smallest. Males had higher home range ( $1.6 \pm 1.1 \text{ km}^2$ ) than females ( $1.03 \pm 0.71 \text{ km}^2$ ). Tapirs traveled on average  $1.590 \pm 1.019 \text{ km/day}$  during the initial period of reintroduction. Males ( $1.599 \pm 0.611 \text{ km}$ ) and females ( $1.575 \pm 0.908 \text{ km}$ ) traveled similar distances throughout the day. The shortest daily distances were from groups of individuals released in areas where there was no presence of other tapirs. Individuals from these groups traveled  $1.321 \pm 0.996 \text{ km/day}$  ( $0.400 - 1.520 \text{ km/day}$ ), while individuals released in areas with established tapirs traveled  $2.060 \pm 1.517 \text{ km/day}$  ( $0.800 - 2.710 \text{ km/day}$ ). The mean distance to the release point during the first 90 days was  $0.512 \text{ km}$  and the maximum distance was  $2.710 \text{ km}$ . During the most critical phase of reintroduction, tapirs mainly used forested areas (61.8%), followed by early stage forest areas (21.8%), open field (11.5%), and agriculture (4%). Overall, tapirs altered their activity patterns over the course of reintroduction, showing a tendency towards similarity with activity patterns of natural populations.

# WORKSHOPS

## WORKSHOP 2

FONDATION SEGRÉ LATIN AMERICAN TAPIR  
GRANT 2020–2024: JOINING EFFORTS FOR  
TAPIR CONSERVATION

Moderator: PATRÍCIA MEDICI

### [W2-1] Mountain Tapir - Ecuador

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Mountain tapirs are the smallest and most endangered tapir species, with an estimated 2,500 remaining in the wild and only six individuals left in zoos world-wide. Native to the Andes Mountains of Ecuador, Colombia, and Peru, their populations are now small and fragmented. To better understand conservation threats and solutions, a multi-institutional team led by the Andean Bear Foundation successfully captured and deployed GPS collars on 11 wild mountain tapirs within the Cayambe Coca National Park and the Llanganates National Park in Ecuador. Following capture, biological samples (blood, serum, hair, saliva, feces, and ectoparasites) and morphometric data were collected. Preliminary analysis of serum samples has revealed the potential disease threats posed by livestock in the region. Tapir movement ecology data suggests finite home ranges. We documented at least two instances of poaching during the study period. For capacity building, we conducted a multi-day (hybrid) movement ecology workshop for aspiring biologists in the region. We also conducted numerous outreach activities including visits to elementary, middle, and high schools; participated in community events and media interviews; and celebrated the World Tapir Day to increase public awareness. Further, we engaged local artisans to produce tapir-themed art and objects; and sponsored a local all-women's soccer team near the Llanganates National Park. On going efforts are focused on the potential impacts of agriculture on tapir health. Our studies have identified additional areas for future conservation action in Ecuador.

## **[W2-2] Baird's Tapir - Guatemala**

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The Guatemala Baird's tapir conservation program by the Centro de Estudios Conservacionistas (CECON) from San Carlos University and Defensores de la Naturaleza Foundation (FDN) was conformed in 2015 as part of the World Tapir Conservation Program from the IUCN SSC Tapir Specialist Group and Fondation Segré. The activities of the program focused on the Maya Biosphere Reserve (MBR), the main stronghold for the species in the country, which have been estimated to contain about 80% of the country's wild population. From 2020 to 2024 our program integrated into the Latin American Tapir Conservation Program from the TSG and Fondation Segré. The main goal of our program was that the long-term population viability of wild tapirs remains stable or improves, in 3 core areas of the MBR which are critical for the conservation of the species in the country, as a result of the establishment of a long-term stable conservation program, promotion of sustainable activities with benefits to the communities and creation of awareness in future stakeholders. The specific objectives were: 1) Capacity building for projects management and touristic activities, 2) Use of technology into threats surveillance and control activities, 3) Education programs improvement and 4) Tapir monitoring in the MBR. For capacity building, there were 3 talks from other tapir conservation programs from different countries sharing their experiences to students and young researchers. Also, there were training sessions for community tourism guides on specific topics to improve their customer service. Additionally, a checklist of the birds in the tapir's habitat in the MBR was printed and distributed in order to promote bird watching activities. The use of technology included the use of drones as support for field patrols, there was also training for the use of drones and field equipment was provided to the protected areas. Educational programs in 3 core areas of the MBR were strengthened by the development of educational material and training for teachers for its use. In 2024 we implemented the second edition of the activity "Students engaging students" in association with partner institutions. For this activity, students from the last year of Elementary School proposed activities to engage younger students into tapir conservation. The activities included plays and educational games. Regarding tapir monitoring in the MBR, we implemented monitoring season for years 2021, 2022 and 2023 in three core areas. Monitoring reports were generated to share the results with local stakeholders. The report

for 2022 included data from seasons 2018 and 2019 from 5 core areas. A relevant outcome from the tapir monitoring activities was that the proposed protocol and results from field seasons 2017 and 2018 were included in the third update of the reserve's Master Plan, which is updated every 10 years. With these activities we contributed to the conservation of the species in this important stronghold in northern Central America.

### **[W2-3] Lowland Tapir - Brazil**

EMILIA PATRICIA MEDICI

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The overall goal of the Lowland Tapir Conservation Initiative (LTCI) is to safeguard the survival of tapirs in all four biomes where the species is found in Brazil - Atlantic Forest, Pantanal, Cerrado and Amazon. Considering that Brazil covers approximately 60% of the lowland tapir geographic distribution in South America (11 countries, 21 eco-regions), our work covers a large part of the species distribution. Our mission is (1) to gather and apply high-quality scientific data and results to substantiate the development and implementation of biome-based conservation strategies for tapirs and their habitat in Brazil, and (2) to use tapirs as ambassadors for conservation in Brazil, catalyzing habitat conservation and protection, environmental education, communication, training and capacity-building, and scientific tourism initiatives. Over the past four years (2020-2023), we have designed and implemented a series of research and conservation activities funded by Fondation Segré and other institutional and financial supporters. This major multi-year contribution from Fondation Segré was critical for the full implementation and success of our initial efforts in the Amazon biome, as well as of our return for a re-assessment of the tapir population in the Atlantic Forest. Despite two years of a global pandemic that killed ca. 7 million people from around the world, we were able to almost fully implement the grant submitted to Fondation Segré under the umbrella of the IUCN SSC Tapir Specialist Group (TSG) and in partnership with three other Latin American tapir programs. During this time, we had eight research objectives: (1) to build and maintain the largest tapir dataset in the world; (2) to run population viability analysis (pva) to determine the conservation status, risk of extinction, and probability of survival of tapir populations in each biome; (3) to develop, implement and evaluate threat mitigation strategies in each biome; (4) to apply the LTCI data and results to the development of biome-based action plans for the conservation of tapirs and their remaining habitat; (5) to implement education programs using tapirs as flagship species in each

biome; (6) to apply effective communication tools to spread the word about the tapir conservation cause; (7) to provide hands-on field experience to the public through scientific tourism; and (8) to train the conservationists of the future and build capacity for effective conservation. These objectives were fully implemented and generated huge amounts of high-quality scientific data that was fed into the LTCl database and applied to the development of conservation actions. These data were also used to substantiate our education, awareness, and communication activities. When it comes to training, the LTCl continues to operate as a hub for training of TSG members interested in establishing similar initiatives in their countries. We continued to train Brazilian students and conservation professionals to run additional tapir research programs in Brazil. Our strategy is to invest in communicating the tapir conservation cause as widely as possible and training the conservationists of the future to leave a legacy of good science, tools, solutions and human resources.

# WORKSHOPS

## WORKSHOP 3

### MULTIFACETED CONSERVATION

Moderator: MANOLO GARCÍA

#### **[W3-1] Beyond Limits of National Parks and Tapirs: Conservation at Eastern Ecuadorian Andes, Llanganates Sangay Corridor**

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The Llanganates Sangay Ecological Corridor (CELS) in central east of Ecuador connects the Andean cloud forest and Paramos with the lowland Amazon in small region that includes over 92000 hectares encompassing critical biodiversity habits and a wide landscape of different geological and consequently constant changes in vegetal formations. CELS enables structural habitat connectivity between two National Parks along the northern and central Andes. In this key region two species of tapirs occur (*Tapirus pinchaque* and *T. terrestris*), and constitutes one of main refuges for these species in eastern Ecuador amidst a heterogeneous landscape of agricultural lands embedded in natural vegetation remnants with varying levels of protection and management.

For sixteen years, with the collaboration of the TSG, NGO's, local owners and communities, we have worked in study, documenting and conserving native populations of tapirs. We have integrated fieldwork research, educational campaigns, and the active involvement of local partners, private stakeholders and conservationists to establish a system of private reserves and conservation initiatives aimed to protect vulnerable habitats for both tapir species as flagship species of CELS, aligning with the current strategic plan for tapir conservation in Ecuador.

We have conducted large-size mammal monitoring programs including camera traps and transect surveys, to identify priority areas for conservation of threatened species outside the National Parks. Information that allowed us to promote

several strategies in favor of the species persistence, including direct actions for the purchase of important land for the conservation of local tapir populations. We also provided scientific-based information to assist local and national authorities in recognizing new protected areas of significance for tapirs. Furthermore, we have collaborated with private owners and local governments in the official declaration of the Llanganates Sangay Connectivity Corridor as an official protected area and ensure the inclusion of adjacent areas as new Key Biodiversity Areas, especially the region northeastern bordering with Kichwa Communities inhabit Anzu, Piatua and Hatunyaku rivers, eastern to Llanaganates mountains.

We acknowledge that the strong relationship bonds we have built with local communities are essential to construct a positive reaction of people neighboring with different tapir populations along the corridor. The conservation strategies have been carried out by local private landowners, NGOs, and ancient indigenous communities on a large-scale, including the establishment of two Protected Areas at national scale (Río Zuñag and Cerro Candelaria), as well as protective forests, Socio Bosque program initiative and community reserves comprising more than twenty thousand hectares of protected zones. Our goal has directly influenced the significant and long-term conservation of tapirs in eastern central Ecuador where main threats are expansion of roads, agricultural-urban areas, mining and oil exploitation.

We conclude that conservation strategies with local participation and multi-disciplinary work are key and essential components of all such strategies worldwide and strongly contribute to accomplish main conservation goals that states establish in biological and conservation agendas like 2030 Agency, CDB, national conservation plans strategies, task forces, finally and very important to follow up, involvement in local communitarian life plans at long term.

### **[W3-2] Mountain Tapir Conservation in Ecuador**

Edgar Martinez<sup>1</sup>, Armando Castellanos<sup>2</sup>, Melchor Ascante<sup>2</sup>, Rodrigo Ascante<sup>2</sup>, Oscar Ascante<sup>2</sup>, Patricio Cruz<sup>2</sup>, LIZA DADONE<sup>3</sup>, Jordan Powell<sup>4</sup>, Diego J. Inclán<sup>5</sup>, Jorge Jhobany Brito Molina<sup>5</sup>, Logan Wood<sup>6</sup>, Dan Houck II<sup>7</sup>, Jared Stabach<sup>8</sup> and Budhan Pukazhenth<sup>8</sup>

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**Mountain tapirs are the smallest and most endangered tapir species, with an estimated 2,500 remaining in the wild and only six individuals left in zoos world-**

wide. Native to the Andes Mountains of Ecuador, Colombia, and Peru, their populations are now small and fragmented. To better understand conservation threats and solutions, a multi-institutional team led by the Andean Bear Foundation, in partnership with INABIO and U.S. zoos, has been placing GPS collars and doing health assessments on free-ranging mountain tapir in two national parks in Ecuador. The team has also been working with local schools, landowners, and a women's soccer club to raise awareness and pride for this species. This presentation highlights field capture techniques, community engagement initiatives, and plans for a national strategy conservation action plan to help ensure a future for mountain tapir in Ecuador.

### **[W3-3] Conservation Status of Malayan Tapirs in Southeast Asia and the Way Forward of the Conservation Initiatives**

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The Malayan tapir is a globally threatened species and listed as Endangered in the International Union for Conservation of Nature (IUCN) Red List due to population decline in the past 36 years. It is also listed as Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) which prohibits international trade of the species. This status review was conducted between 2022 to 2024 using desktop assessment and interviewing field researchers across Southeast Asia. The main objective of this review was to update the current population status of wild Malayan tapirs in their natural habitat, and assess risks and threats faced by the species and conservation action taken. To date, the species continue to exist in Peninsular Malaysia, Sumatera (Indonesia), along the western to the southern part of Thailand and the southern part of Myanmar, especially in Tanintharyi Region and some parts of Kayin State. All countries are facing similar risks and challenges to the species specifically habitat loss and forest fragmentation. Malayan tapirs are also reported as by-catch of snares set by illegal poachers. Malaysia recorded an increased number of road-kills and it is considered one of the main threats to the species in Malaysia. Indonesia highlighted forest and peatland fires as one of several pressures on wildlife including the Malayan tapir. In 2023, the Malaysian Department of Wildlife and National Parks launched the Malayan tapir

Conservation Action Plan (MATCAP) 2021-2030. The Action Plan lists four (4) strategies including: (i) Habitat Management, (ii) Ex-situ Management, (iii) Communication, Education and Public Awareness, and (iv) Research on the species. Malaysia's Department of Wildlife and National Parks estimates that the Malay tapir population has dropped from 1,100-1,550 individuals in 2013 to 700-800 individuals in 2020. Continuous monitoring to gather more recent data on the species' basic ecology is seen as crucial in some countries and there is potential for regional cooperation to close these gaps. Collaboration at the regional level could also strengthen the existing conservation initiatives.

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# ROUND TABLES

## ROUND-TABLE 1 CLIMATE CHANGE

Moderator: BIANCA REBELATTO

### **[RT1-1] Potential Impacts of Climate Change on Baird's Tapirs in the Maya Biosphere Reserve in Guatemala**

MANOLO J. GARCÍA<sup>1\*</sup>, Mynor A. Sandoval<sup>1</sup>, Andrea L. Aguilera<sup>1</sup>, Katarina F. Hooper<sup>1</sup>, José M. Tun<sup>1</sup>, M. Gabriela Cajbon-Vivar<sup>1</sup> and Oscar Martínez-López<sup>1</sup>

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The Maya Forest, shared by Mexico, Guatemala and Belize and considered one of the main strongholds for Baird's tapir on its distribution range, has been identified as vulnerable to the potential effects of climate change. The Maya Biosphere Reserve (MBR) contains the largest portion of the Maya Forest in Guatemala. Here we present results from three researches related to the potential effects of climate change on Baird's tapir activity patterns, potential distribution and population viability. In the first research, the activity pattern of tapirs visiting seasonal ponds, locally known as *aguadas* was characterized. Also, the relationship between activity patterns with climatic variables was evaluated. Tapirs in *aguadas* are mostly nocturnal and a significant interaction was observed within the time between visits and temperature, indicating that tapirs visit *aguadas* more frequently when there are higher temperatures. In the second research, the potential distribution of Baird's tapir was modeled for historical conditions (1970-2000) and future scenarios (2081-2100), based on 534 presence records and 16 bioclimatic variables. For historical conditions, the variables with more influence in the model were Bio14 Precipitation of Driest Month (26.6%) and Bio4 Temperature Seasonality (15.7%). For future scenarios it was estimated a reduction of the probability of specie's occurrence in the western section of Petén state where the MBR is located. For the forest cover in 2016 it was estimated that only 38% of the potential habitat still remained. In the third research, a population viability analysis (PVA) for tapir in the MBR was conducted considering three threats: habitat loss, hunting and climate change. For each threat, three scenarios were constructed corresponding to a baseline (with no effect of the threat), optimistic and pessimistic, for a period of 100 years. Habitat loss with current deforestation rates was projected until only core and multiple use zones of the MBR remained in the optimistic scenario and only core zones remaining for the pessimistic scenario. Regarding hunting, the scenarios were projected based on

data available for the MBR. For climate change, reduction on the carrying capacity was estimated based on the potential distribution for the year 2070. Three main scenarios were built by the addition of each threat's scenarios respectively. In the baseline scenario, the population will remain stable for the following 100 years. For the optimistic scenario, it was estimated that the population will decrease to about 50% in 100 years, while for the pessimistic scenario, it was estimated that the population will become extinct in 40 years. The results from these studies, suggest that the potential impacts of climate change on tapir in the MBR can be severe, even bringing the local population to extinction in the midterm, which in turn, would increase the risk of extinction for the species globally, as the Selva Maya is one of its last strongholds. More research is needed in order to improve these analyses. Also, long-term monitoring should be implemented to determine if tapir populations are being altered.

## **[RT1-2] Tapirs in the Amazon-Cerrado Region: Synergistic Effects of Climate and Land Use Change on Extinction Risk**

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Climate and land use changes in the Anthropocene are key drivers of shifts in biodiversity patterns. While climate change is widely debated for its effects on species distribution and extinction risk, land use changes are less explored on large scales, often studied in landscape studies linking landscape configuration and composition to biodiversity patterns. Those processes are commonly analyzed in a nested framework, in which climate regulates processes over large scales, while land use affects local processes, such as population dynamics and animal movement. Nevertheless, the large impacts of land use change should not be underestimated, especially when the conversion happens throughout large areas and over a short period, as in the Amazon-Cerrado Region (ACR), with high deforestation rates and agriculture expansion over the last 40 years. The rapid and wide transformation of the landscape is certain to affect biodiversity on several levels, which could be even intensified when climate change is considered. Tropical forests rely highly on vertebrates for seed dispersal, with almost the totality of canopy and understory tree species dependent on zoochory transport. Among those species, the lowland tapir is unique both in body size and distance traveled, being a cornerstone species for dispersing several tree species over large areas. While this species is commonly observed in open areas and crop fields, it still requires large areas of native vegetation to persist in a region. Henceforth, we use ecological niche models (ENMs) and dynamic population models to explore the effects of climate and land use conversion throughout the ACR over tapir populations. We fit spatially explicit

population models over the suitability patterns predicted by ENMs to quantify how tapir abundance is affected by climate and land use in the ACR. We compare current land use scenarios (1985 and 2021) with a baseline scenario with no anthropogenic land use and make predictions considering future climate and land use conditions. Tapir abundance declined sharply as agriculture expanded, with indigenous territories (IT) and protected areas (PA) acting as sanctuaries. Outside those areas, average abundance declined by 14% in 1985 and 36% in 2021, remaining relatively stable inside IT-PAs, with an average decrease of 7%. Climate change had a low potential impact on tapirs, but future land use changes will decrease abundance outside protected areas by approximately 14% for both ssp245 and ssp585. Those changes will increase tapir extinction risk in the ACR by only 2%, in impact buffered due to the large IT-PAs in the Amazon. Nevertheless, extinction risk increases substantially at regions with higher levels of anthropogenic land use, such as the Paranaíba Basin, in which tapir extinction risk will be close to 40% in 2080. Regional predictions are important to plan mitigation actions and reduce the negative effects on ecosystem resilience and forest regeneration processes caused by the reduction in tapir seed dispersal. The reforestation of heavily anthropogenic areas and maintenance of large fragments of native vegetation appears as the optimal strategy to maintain regional tapir abundance.

# ROUND TABLES

## ROUND-TABLE 2 THE IMPORTANCE OF TAPIRS FOR BIODIVERSITY MAINTENANCE

Moderator: PATRÍCIA MEDICI

### **[RT2-1] How Canopy Cover and Tapir Seed Dispersal May Shape Forest Recovery?**

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Deforestation, habitat fragmentation, and natural events decrease forest canopy coverage due to falling leaves, branches, and trees. Canopy coverage variations generate different microhabitats throughout the forest, where several fundamental processes for forest regeneration occur – such as predation and removal of seeds, recruitment, and establishment of seedlings. In nature, canopy cover variation and endozoochoric seed dispersal occur simultaneously. We investigated how canopy cover and the presence of tapir dung modulate secondary events of predation and seed removal and whether this influences seedling recruitment and establishment. We tested the following hypotheses: (i) seed predation is higher when seeds are inserted in tapir dung, (ii) seed predation in dung increases as canopy cover increases, (iii) seed removal increases as canopy cover decreases, and (iv) recruitment and establishment of seedlings in tapir dung increases as canopy cover decreases. We also evaluated the potential for effective dispersal of tapirs by assessing seed viability and germination. We sampled dung in a 560 hectares fragment of native vegetation. Canopy cover ranged from 48% to 98.4%. At each sampling location, we added 300 g of tapir dung containing seeds, and free seeds on the ground. We evaluated seed predation and removal in both treatments. To assess seedling recruitment, we monitored the tapir dung for six months. We evaluated the viability of the seeds found in tapir dung. Individually, canopy cover and tapir dung presence did not affect the proportion of predated seeds. Seed predation was significantly affected by the interaction between canopy cover and tapir dung presence. Seed predation increases with an increase in canopy cover within tapir

dung but decreases with an increase in canopy cover when disposed of on the ground. The average proportion of seeds removed per tapir's dung was lower within tapir dung than for seeds on the ground and was not affected by canopy cover. The number of recruits was 10,8 times higher in the first month than in the sixth month but did not vary with canopy cover. We counted 752 seeds in nine kilos of dung, with the species *Genipa americana* representing approximately 92% of the total seeds (N=630). Of the 26 native species in tapir dung, 24% germinated. Canopy cover and seed dispersal by tapir affect plant regeneration through different mechanisms but in an interactive way. Tapirs may have a reduced impact on forest regeneration in areas with higher canopy cover. Nonetheless, this limitation can be mitigated by a higher number of intact seeds within their dung, which have a higher germination potential and are often identified as promising species for the recovery of degraded areas. Tapirs' capability to disperse seeds over long distances enhances their role in forest regeneration. Tapirs may play a crucial role in passive restoration programs for degraded forests. After six months, the seeds dispersed by tapirs remain viable, highlighting the efficacy of tapir-mediated seed dispersal. Population decline or local extinctions of tapirs could affect seedling recruitment, vegetation dynamics, and the recovery of degraded forests.

## **[RT2-2] Tapir Dung as a Key Driver of Forest Regeneration and Soil Enrichment in Agricultural Landscapes**

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Large frugivores like the lowland tapir (*Tapirus terrestris*) play a significant role in forest regeneration by dispersing seeds over long distances into disturbed forests. For instance, tapir dung density and seed dispersal are higher in burned forests than in unburned forests. Our study investigates the impact of dung deposition on seedling recruitment and its implications for forest regeneration. Additionally, we investigated underlying mechanisms associated with seedling recruitment from tapir dung, including secondary seed dispersal, seed removal within dung, and soil nutritional quality beneath dung. For this, we collected and deposited dung piles in burned and unburned forests bordering soybean crops at Estação de Pesquisa Tanguro (MT, Brazil) in February 2023. We assessed the community and ecosystem functions (seed and dung removal) of dung beetles attracted to tapir dung. We also evaluated seedling recruitment in dung addition plots with and without dung beetle access and a control plot without dung addition, and we monitored the seedling

recruitment for seven months. Additionally, we measured seed removal within and outside dung, and quantified soil microbial biomass, soil and seedlings phosphorus beneath and around dung clumps, respectively. Due to the high abundance of soybean parts and the low number of forest seeds found in the dung during the initial phase of the study, we repeated the assessment of seedling recruitment in September 2023. The assessment was made during the soybean sanitary vacuum period in Mato Grosso State, and we monitored it for five months. Only four forest seeds were found in the 25 kg of feces collected for the experiment setup in February 2023. This could explain why no seedlings were recruited from the feces at the end of the experiment, in September. However, at the end of the second monitoring cycle (February 2024), we found 33 seedlings, all in plots with dung addition. Dung beetle community and ecosystem functions did not differ between fire treatments, suggesting a functional equivalence in the beetle community and their ecosystem functions. Seed removal inside dung was lower than outside, and we recorded a higher number of whole seeds inside than outside dung, indicating a protective role from tapir dung to the seeds. Finally, the soil beneath dung piles had microbial biomass and total phosphorus content higher than control soils, but the phosphorus content in seedling tissues did not differ. This is a crucial role of tapir dung in ecosystems, as phosphorus is one of the most limiting elements in tropical forest soils. Therefore, tapirs are important for forest regeneration, promoting an increase in seed rain and subsequent seedling recruitment, but in the presence of easily accessible non-forest food resources in their habitat, like soybean, seed dispersal is compromised. Despite this apparent seasonality of seed disperser function, tapir dung increases soil nutritional content and biological activity. In agriculture frontiers, where tapir lives in cropland surroundings, their function as “forest fertilizer” can be the most concise and stable function.

### **[RT2-3] Large Wild Herbivores Slow Down the Rapid Decline of Plant Diversity in a Tropical Forest Biodiversity Hotspot**

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The UN declaration of the Decade of Ecosystem Restoration 2021–2030 emphasizes the need for effective measures to restore ecosystems and safeguard biodiversity. Large herbivores regulate many ecosystem processes and functions; yet their potential as a nature-based solution to buffer against long-term temporal declines in biodiversity associated with global change and restore diversity in secondary forests remains unknown. By means of an exclusion experiment, we tested experimentally the buffering effects of large

wild herbivores to avert against long-term biodiversity collapse in old-growth and secondary tropical forests in the Atlantic Forest of Brazil where sapling abundance and species richness declined c. 20% over the course of 10 years. The experiment comprised 50 large herbivore enclosure-open control plot pairs (25 at the old-growth forest and 25 at the secondary forest), where 2 m<sup>2</sup> were monitored in every plot during a 10-year period. Large herbivores were able to decelerate diversity declines and compositional change in the species-rich old-growth forest, but only decelerated compositional change in the secondary forest. In contrast, declines in species richness and abundance were unaffected by large herbivores on either forest. The buffering effects of large herbivores were strongly nonlinear and contingent on the initial level of diversity at the patch scale: highly diverse communities suffered the strongest collapse in the absence of large herbivores. Thus, larger buffering effects of large herbivores on the old-growth forest are the logical consequence of large herbivores buffering the many high diversity plant communities found in this forest. Conversely, as the secondary forest held fewer high diversity patches, buffering effects on the secondary forest were weak. Our study indicates that large herbivores have moderate yet critical effects on slowing down community change and diversity loss of highly diverse plant communities, thus suggesting that the conservation of (and potentially trophic rewilding with) large herbivores is a fundamental nature-based solution for averting the global collapse of the strongholds of biodiversity. Its buffering effects on biodiversity loss operate at very small spatial scales, are likely contingent on successional stage and are most effective in old-growth or high diversity secondary forests.

# ROUND TABLES

## ROUND-TABLE 3 COMMUNICATION & PUBLIC AWARENESS

Moderator: MARIANA LANDIS

### **[RT3-1] Social Media as an Ally for the Conservation of Lowland Tapirs in Brazil**

RAQUEL DE OLIVEIRA ALVES<sup>1\*</sup> and Emília Patrícia Medici<sup>1,2,3</sup>

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Communication takes place in different ways and is something present in multiple aspects of people's daily lives. Therefore, it is extremely important to include communication in wildlife research and conservation initiatives. The way we communicate changes over time and the tools that are currently trending tend to change. These days, we see a significant growth of social networks in people's routines. Social networks began to emerge in the 90s, but society's relationship with such platforms was very different from the current scenario. With the advancement of the internet in the 2000s, social networks began to grow as well. However, the development and role of these platforms reached another level with the Covid-19 pandemic. Despite their relatively recent history, social networks play a significant role in our society – to the point of influencing political, social and economic issues. Approximately 62% of the world's population is present on social networks, according to a survey by digital consultancy Kepios. The most used networks in the world are WhatsApp, Instagram and Facebook. Brazil is the 3rd country that uses social networks the most, with an average of 3h37min spent daily on these platforms. In addition, Brazil is the 5th country that uses Instagram the most. Thinking only about the advancement of Instagram, the role of this social network is stark – this communication channel was launched in 2010 and today has 1,65 billion users. The communication of conservation causes presents several challenges. Some of these challenges include the constant changes in the platforms (changes in allowed resources and user usage patterns), language adaptations so that we do not fall into academic and inaccessible language, but without trivializing science. Besides, breaking through the logic of the algorithms that dictate such tools to

pierce the public's bubble can be complex. When it comes to the communication of an endangered and uncharismatic species, such as the tapir in Brazil, it is necessary to make use of different tools to insert conservation in people's lives. In Brazil, the tapir has a public relations problem! Culturally, it is associated with lack of intelligence and its name is used in a pejorative way. For this reason, since 2008, the Lowland Tapir Conservation Initiative has included communication as one of its core components. Communication through social media has been an accessible and dynamic way to break this cultural construction.

### **[RT3-2] Tapir Conservation and Social Media: One Zoo's Perspective on Increasing Public Engagement for Tapir**

LAUREN KIMBRO<sup>1</sup> and DAN HOUCK<sup>2</sup>

<sup>1</sup>Manager of Animal Care and Training/Social Media Manager at Highpoint Haven/Pilot Point TX; Lauren@highpointhaven.com

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We currently live in a society where our lives seem more and more connected with social media. Social media platforms such as Instagram, Tik Tok and Facebook can increase awareness and engagement for endangered species such as tapir. Highpoint Haven is home to a pair of lowland tapir named Wally and Amy, and regularly features them on our social media platforms Gerald's.life on Instagram and Tik Tok as well as Highpoint Haven on Facebook. By incorporating regular segments of "Tapir Tuesday" and "Wally Wednesday" we have been able to develop a fan base for our tapirs as well as help promote conservation efforts and fundraising in 2023. Our future social media goals include more ways to engage audiences to be even more connected with the tapir community. This presentation will highlight some ways social media has helped us raise awareness and support for tapir conservation and will show examples of what has been effective for our animal facility when engaging the tapir community.

### **[RT3-3] The Contribution of Conservation Marketing to Encouraging the Adoption of Pro-Conservation Behaviors of the Tapir (*Tapirus terrestris*)**

AMARAL, L.R.<sup>1\*</sup> and Gonçalves, M.L.<sup>1</sup>

<sup>1</sup>Large Mammals of the Serra do Mar Program (IPeC Institute and Manacá Institute)

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A Society for Conservation Biology defines conservation marketing as 'the ethical application of marketing strategies concepts and techniques to influence attitudes, perceptions and behaviours of individuals, and ultimately societies, with the objective of advancing conservation goals.' To encourage change and adoption of pro-conservation behaviors, disseminating information is not enough. It is necessary

to outline strategies for transferring knowledge, adapting communication to the intended conservation goals and target audiences. In this context, conservation marketing concepts, methodologies and techniques direct actions, optimizing resources and results.

Since 2022, the Large Mammals of the Serra do Mar Program – which carries out the largest large-scale monitoring, on 1.7 million hectares, in Serra do Mar in the States of Paraná and São Paulo – has been carrying out an annual campaign called Antástica Week, which uses concepts and strategies from conservation marketing. The second name of the campaign “antástica” is a pun on the portuguese word “fantástica” (fantastic), to make a positive association with the tapir (*Tapirus terrestris*). Among the main objectives of the campaign – carried out on social media and in the press in the area where the Large Mammals of the Serra do Mar Program operates –, are to increase the knowledge that the target audience has about the tapir, generate more empathy and sympathy for the species and stimulate the adoption of pro-conservation behaviors of the tapir, especially support and engagement in scientific research initiatives, admiration for Conservation Units, preference for ecotourism, denouncing hunting of wild animals, choosing politicians who consider biodiversity conservation in its government plans.

Therefore, for seven days in April, in the week in which World Tapir Day occurs, the campaign involves the dissemination of content that: explores the charismatic potential that the tapir exerts as a species of brazilian charismatic megafauna, especially the calves; that explain the animal's ecology in a simple and accessible way; and show the benefits of conserving the species, such as maintaining the forest and the ecosystem services linked to it, especially water availability and mitigating climate change, using marketing to appeal to the benefit attributed when there is a change in pro- conservation of the species.

Social media strategies are also used to produce content, considering publication formats with the greatest reach and potential for engagement on platforms. In the press, mass media outlets are chosen, but they cover environmental issues more frequently. The campaign's target audience is people aged 25 to 45, with an education level above Elementary School, between the Lower Class and Middle Class, and who have been receptive (i.e., stayed longer in the publication) to environmental posts.

# ROUND TABLES

## ROUND-TABLE 4 HUMAN DIMENSIONS OF TAPIR CONSERVATION

Moderator: ROBERTA MONTANHEIRO PAOLINO

### **[RT4-1] Poaching and Hunting, Conflicts and Health: Human Dimensions of Wildlife Conservation in the Brazilian Cerrado**

ROBERTA MONTANHEIRO PAOLINO<sup>1,2\*</sup>, Caroline Testa Jose<sup>3</sup>, Renata Carolina Fernandes-Santos<sup>3,4</sup>, Mariana Bueno Landis<sup>1,5</sup>, Gabriela Medeiros de Pinho<sup>3,4</sup> and Emilia Patricia Medici<sup>3,4,6</sup>

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Understanding human-wildlife interactions is critical to overcoming the socio-environmental crises we face worldwide. Among these interactions, poaching and hunting, human-wildlife conflict, and transmission of zoonotic diseases are major causes of biodiversity loss and detrimental to human well-being. Therefore, this study aimed to analyze wildlife poaching, feral pig hunting, human-wildlife conflict, and health issues in a region of the Brazilian Cerrado, in the state of Mato Grosso do Sul. The study also focused on the lowland tapir (*Tapirus terrestris*), a poached species listed as vulnerable to extinction. From October 2016 to September 2017, we conducted face-to-face semi-structured interviews with 51 local people from nine stakeholder groups. Interview answers and additional information compiled during the study were evaluated using coding, narrative, and co-occurrence analyses. We found that the main human-wildlife conflict in the region involves feral pigs, and hunting is practiced as a population control strategy. The lowland tapir is not considered a conflictual species, as it is beloved by most people. However, tapirs are still poached, although less so than in the past, mainly for cultural reasons. Culture was the main motivation behind wildlife poaching

in general. We identified 28 species and five taxa currently poached in this Cerrado region, of which 11 are used for medical and aphrodisiac purposes. Historically, wildlife poaching was linked to poor livelihood conditions and lack of support from governmental institutions during the Agrarian Reform process, becoming a cultural habit over the years.

Nevertheless, wildlife poaching is less frequent than in the past, and its main barriers are surveillance, poaching prohibition by landowners, and social norm. Therefore, promoting a change in the way people relate to nature, meeting socioeconomic needs, and increasing surveillance appear to be important conservation strategies. Although feral pig hunting may replace wildlife poaching, some hunters still poach wild species, especially peccaries. Hence, it is necessary to keep hunters under surveillance, raise awareness among them, and make them allies in conservation strategies. We found a worryingly low level of awareness about disease transmission risk through bushmeat manipulation and consumption, highlighting the importance of One Health approaches.

## **[RT4-2] Human-Tapir Interactions in a Protected Area of the Atlantic Forest, Brazil**

MARIANA BUENO LANDIS<sup>1</sup>, Silvio Marchini<sup>2</sup>, Roberta M. Paolino<sup>3</sup> and Katia M. P. M. B. Ferraz<sup>4</sup>

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The growing spread of human settlements has led to an increase in the interactions between humans and the endangered lowland tapir and can result in negative or positive effects on people and tapirs depending on the ecological and social context. Stakeholder assessment through social research provides vital information for defining and implementing conservation strategies, aiding in better conservation policies and management actions. The present study aimed to analyze the interactions between tapirs and humans and understand people's attitudes towards the species conservation, thus contributing to better management strategies for the species and its habitat. The study was carried out at Carlos Botelho State Park, a strictly protected area, where social data were collected through face-to-face semi-structured interviews. Descriptive, qualitative research revealed that the tapir is the most common species in agriculture-dependent communities, not occurring inside forest-dependent communities. The tapir is the species preferred by most interviewees and considered the most annoying for 25% of them, due to the damage they cause in cultivation. Negative attitude was held only by people whose crops were consumed by the species.

Human-tapir interactions included crop raiding, poaching and roadkill, and threats such as the use of pesticides and persecution by domestic dogs. Poaching was the only interaction in forest-dependent communities, while in agriculture-dependent communities all interactions were present. Interactions with negative and positive effects are favored by the availability of food resources from crops, and human-tapir conflict should be a priority in the implementation of strategies that promote the reduction of damage to crops and of retaliatory killing. Positive attitudes towards the species were frequent (78%), suggesting acceptance by people and the tapir's potential to become a flagship species in the region. The present study provides an understanding of how people relate to the tapir and can guide the design of more effective strategies to reduce negative impacts on tapirs and guarantee the well-being of the people who share the landscape with this species.

### **[RT4-3] Exploring Belizeans Perspective: Attitudes Towards Belize's National Animal (*Tapirus bairdii*) and the Influence of Wildlife Value Orientation and Socio-Demographics**

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Within the context of Belize's expanding nature-based tourism industry, wildlife experience is increasingly becoming a key driver of this sector, and understanding local perspectives towards wildlife is crucial for effective conservation planning. To this end, the relationship between Belizean attitudes towards their representative national animal, the Central American tapir (*Tapirus bairdii*), wildlife value orientation (WVO), and sociodemographic characteristics were explored. It was proposed that the local community's attitudes and WVO are pivotal in shaping conservation outcomes. This was explored through hypotheses testing based on the cognitive hierarchy model of human behavior, which links deep-seated values to specific attitudes and observable behaviors.

In-person point intercept surveys were conducted across the six districts of Belize. The methodology included Exploratory Factor Analysis (EFA) to validate the survey instrument, Confirmatory Factor Analysis (CFA) to affirm the structure of WVO constructs, and Structural Equation Modeling (SEM) to explore the interrelations between attitudes, WVO, and demographic variables.

The results revealed a predominantly positive attitude towards tapirs, with a significant majority supporting strong conservation measures. Approximately 84% to 99% of participants recognized tapirs' ecological roles and expressed pride in them as a national symbol. Mutualism WVO was strongly associated with positive conservation attitudes ( $\beta = 0.374$ ,  $p < 0.001$ ), while domination WVO predicted a greater acceptance of lethal management practices ( $\beta = 0.118$ ,  $p = 0.019$ ). Socio-demographic factors such as urban residency and employment in the tourism sector were correlated with mutualistic values, enhancing pro-conservation attitudes.

Conversely, rural and farming communities displayed a tendency towards domination orientations, indicative of a rational approach to wildlife management driven by direct livelihood impacts such as crop damage. Educational attainment emerged as a decisive factor; higher educated individuals were less supportive of lethal management ( $\beta = -0.199$ ,  $p < 0.001$ ) and more favorable towards tapir conservation ( $\beta = 0.209$ ,  $p < 0.001$ ).

These findings highlight the important role of local values and demographics in shaping wildlife conservation strategies. They suggest that educational and community engagement programs promoting mutualism could adjust public perceptions and foster an environment conducive to wildlife conservation. The study also reaffirms the importance of flagship species like the tapir in mobilizing conservation efforts and leveraging educational initiatives and community involvement to align conservation objectives with local realities, ensuring the coexistence of humans and wildlife in Belize.

#### **[RT4-4] Preliminary Study on Malaysian Attitude toward the Malayan Tapir and their Willingness to Support its Conservation Efforts**

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Understanding how Malaysians respond to the Malayan Tapir and its conservation initiatives is important because what is commonly known is based on personal observations and communications, lacking a systematic record for a better understanding of Malaysian attitude towards the Malayan Tapir. An online survey was conducted between April to June 2022 to obtain preliminary information from respondents residing in Peninsular Malaysia on their attitude towards the Malayan Tapir and their willingness to support the Malayan Tapir conservation initiatives. Their level of agreement with the statements was recorded using the 5-point Likert scale (1= Strongly disagree to 5=Strongly agree).

Responses from 232 respondents showed that Malaysians have a positive attitude towards the Malayan tapir ( $M=4.49$ ;  $SD=.62$ ). Despite past personal

communications and study (Lim et al., 2016) show that some Malaysians believe its physical appearance is akin to the wild boar, the respondents have a positive attitude towards its physical characteristics ( $M=4.28$ ,  $SD=.65$ ) and their ecological functions ( $M=4.15$ ,  $SD=.85$ ). They were neutral towards the issues threatening the Malayan tapir ( $M=3.21$ ,  $SD=.73$ ) but positively support the importance of its conservation ( $M=4.52$ ,  $SD=.60$ ). The positive attitude to support the conservation of the Malayan Tapir could be attributed to the Malayan Tapir being regarded as one of the most unique wildlife in Peninsular Malaysia (94.2%), which is important to sustain Malaysian's biodiversity (94.8%). They also indicated that there is an urgent need to conserve the Malayan tapir before it goes extinct, just like the Sumatran rhino (94.8%). Malaysians agreed that the Malayan tapir is a wildlife species that is worth conserving for the country (94.3%), hence its conservation should begin now (96.2%). In fact, the Malayan Tapir should be made an iconic conservation species in Peninsular Malaysia (87.6%).

Malaysians' responses towards their satisfaction with the existing conservation activities in the country were mixed. A total of 39.3% stated being satisfied and 39.2% dissatisfied while 21.5% were not bothered. When asked about their willingness to be involved in supporting the Malayan Tapir conservation initiative, the majority chose activities such as sharing relevant information to promote awareness through social media (51.2%) and joining Malayan Tapir awareness campaigns (56.9%). Nearly half of the respondents (49.3%) reported their interest in getting involved in local community initiatives for the conservation of Malayan Tapir such as tree planting and monitoring programs. Donating money to the Malayan Tapir conservation fund (33.5%) and supporting the Malayan Tapir adoption program (28.2%) were the least favored activities.

Although the study may be limited to those who have knowledge and skills in using social media applications, the study provides important baseline information to guide the implementation of the Malayan Tapir Conservation Action Plan (2021-2030) in developing and executing strategic actions that fit Malaysian needs and expectations.

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# PANEL DISCUSSION

## PANEL DISCUSSION 1 TAPIR CONSERVATION IN ZOOS: CONVERTING STORIES TO ACTION

**Moderator:** RICK BARONGI

**BUDHAN PUKAZHENTHI** – USA – Smithsonian National  
Zoo and Conservation Biology Institute

**LEWIS GREENE** – USA – Zoo Conservationist

**LIZA DADONE** – USA – Giraffe Veterinary Services

**THOMAS KAUFFELS** – Germany – Opel-Zoo

## PANEL DISCUSSION 2 TAPIR CONSERVATION IN THE ATLANTIC FOREST

**Moderator:** KEVIN FLESHER

**GABRIELA MEDEIROS DE PINHO** – Brazil – LTCI-IPÊ, UFSCAR & IUCN  
SSC TSG

**MARCELO MAGIOLI** – Brazil – Instituto Pró-Carnívoros

**MARIANA LANDIS** – Brazil – Instituto Manacá

**MARON GALLIEZ** – Brazil – IFRJ & REFAUNA

**PATRICIA MEDICI** – Brazil – LTCI-IPÊ & IUCN SSC TSG

**PAULO ROGERIO MANGINI** – Brazil – Pró-Tapir

**ROBERTA MONTANHEIRO PAOLINO** – Brazil – University of São Paulo

## PANEL DISCUSSION 3 MOUNTAIN TAPIR CONSERVATION

**Moderator:** BUDHAN PUKAZHENTHI

**CARLOS GALVIS** – Colombia – Cali Zoo

**DIEGO LIZCANO** – Colombia – WCS

**GUSTAVO ADOLFO PISSO FLOREZ** – Colombia – Wildlife Department

**JAKE OWENS** – USA – Los Angeles Zoo

**JUAN FERNANDO DURAN** – Ecuador – Leito Wildlife Reserve

**JUAN PABLO REYES PUIG** – Ecuador – Ecominga/FOER

**LIZA DADONE** – USA/Ecuador – Giraffe Veterinary Services

**NICOLE SHERIE ORMAZA** – Ecuador – Quito Zoo – FZE

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