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Extreme fighting and vocalizations in *Tapirus bairdii*: observations from *aguadas* of Calakmul, social arenas for the species

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Extreme fighting and vocalizations in *Tapirus bairdii*: observations from *aguadas* of Calakmul, *social arenas* for the species

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Simple Summary: Tapirs are shy animals that live a secretively live in the deep of the tropical forest of America. With the help of camera traps, we described how some adult tapirs get in-volved in serious fight and how they displayed a lot of different behaviors that we rarely see such as whistling, marking trunks, chasing each other, biting each other, among others. All these behaviors happen apparently for gaining access to a female in estrus. We described and recorded these rare behaviors with the aim of understand better the dynamic that occur among members of this shy and endangered species of ungulate of the Maya Forest, we hope that all this information can help its conservation.

Abstract: We report and describe unusual behaviors of fighting and whistling in a species considered to be shy and calm. Baird's tapir is the largest of all Neotropical mammals and lives in dense well conserved tropical forest of America. For ten years, in the Calakmul Biosphere Reserve of Southern Mexico, we have monitored tapir population in ponds locally named *aguadas* that serve as social arenas for the species. Recently, we obtained 97 video records in which some tapirs get involved in serious fights and other behaviors related probably to courtship, including several types of whistles. We described what we recorded and interpret these behaviors when possible. These rare behaviors in tapir can explain several of the wounds and scars that many adults of the population show and help us to understand better the social dynamics of this shy and endangered species of neotropical ungulate. We hope that all this information can help its conservation.

Keywords: tapir fighting; Maya Forest; tapir courtship; tapir whistles; *aguadas.*

Introduction

The Baird's tapir or Central American tapir (*Tapirus bairdii*), a member of the Perissodactyl family, is the largest Neotropical terrestrial mammal. It is a solitary, nocturnal species whose shy behavior normally prevents observations on its natural behavior. Tapirs are also naturally rare because they live in low densities across their distribution range due to low reproductive rate (Meyer et al. 2022). Baird's tapirs range from Mexico to Colombia in well preserved humid tropical forest. The distribution range has shrunk considerably in the last 20 years (Schank et al. 2020) due to forest loss and hunting pressure (Garcia-Vettorazzi et al. 2016; www.iucnredlist.org).

To study elusive and rare species like Baird's tapir, several tools and methods have been developed over the years. Camera traps are one of the most common noninvasive methods that wildlife ecologist use to acquire information, particularly related to behavior and population dynamics (O'Connell et al., 2011). With camera traps for example, in the Calakmul Biosphere Reserve (Southern Mexico; CBR hereafter), we have found that tapirs socialize 13 % of its time, with male and female being the most common association (Reyna-Hurtado and Arias Domínguez 2024). It was also evident that tapirs use ephemeral ponds that exist in the protected area as *social arenas* (Reyna-Hurtado and Arias-Dominguez 2024), sites where individuals visit to gather information about conspecifics, to interact with other members, to strengthen social networks, or just to exchange information (Turkalo and Fay 1995, Giljov and Karenina 2024).

Tapirs are considered gentle animals that avoid fighting and that its main defense is to hide and secretively move under the forest or to flee to ponds, avoiding humans and predators such as jaguars (Meyer et al. 2022). In fact, tapirs that present several scars on the back are believed that are due to jaguar attempts to hunt them and where tapirs escaped alive due to the thick skin they have and their large body (Perez-Flores et al. 2021, Meyer *et al.* 2022). Regarding to territoriality, there is no information for tapirs, however, tapirs apparently have a defined home range in which they move constantly searching for water and other resources (Reyna-Hurtado et al. 2016; R. Reyna-Hurtado unpublished data). Other characteristic of the cryptic behavior of tapirs is that they rarely emit any sound, and when they do, they produce a high pitch whistle that apparently have the purpose of searching mates, or to warn same sex conspecifics of their presence (Gómez-Hoyos et al. 2018).

For more than ten years we have deployed camera traps in some ephemeral ponds (locally known as *aguadas*) inside the CBR, the largest protected tropical forest in Mexico and part of the Maya Forest, a shared forest with Guatemala and Belize. The purpose of the monitoring program with camera traps is to obtain information on elusive species such as tapirs, white-lipped peccary and jaguars among other species of wildlife (Reyna-Hurtado et al. 2012; 2016; 2019; 2024). During these years, we have collected more than 13,000 photos of tapirs that account for 600 visits of the species to 18 a*guadas* along 10 years. These visits to the *aguadas* have taught us that tapirs are solitary, nocturnal and that they

socialize some percentage of their time (13%). Also, that they can show site fidelity for more than 10 years (Reyna-Hurtado and Arias-Dominguez 2024) and that they move and use *aguadas* located in large home ranges (between 40 to 70 km^2; Reyna-Hurtado et al. 2016; R. Reyna-Hurtado unpublished data). However, in late April and early May 2024 camera traps recorded several interactions among at least three (possible four) tapirs in an *aguada* for 17 days that presented to us exciting new information about courtship behaviors, whistle behavior, and the intense fights that occur around that time, information also that explain several of the scars that we normally see in a tapir's body.

Material and Methods

In Southern Mexico, and as part of the Maya Forest, there is the Calakmul Biosphere Reserve (CBR hereafter; Fig. 1) a protected area decreed in 1989, with an extension of 7,289 km2. This protected area is located in southeast Campeche state, 19°15'17" N, 90°10'89" W (Carabias-Lillo et al. 1999). The reserve's hydrography is determined by the amount of rainfall, but generally the water flows underground and only in a few places the water accumulates in the soil's surface forming ephemeral ponds (Reyna-Hurtado et al. 2010). These ponds are vital components of the landscape for wildlife and for humans especially during the many times harsh dry season (Reyna-Hurtado et al. 2010, Pérez-Cortez et al. 2012). The main vegetation types are high evergreen forest, medium sub evergreen forest, low evergreen and deciduous forest, savanna and hydrophytes (Carabias-Lillo et al. 1999, Martínez and Galindo-Leal 2002). In the region, there is a tropical sub-humid climate, with a rainy season in summer (June to November) and a dry season in winter-spring (February to May), having an annual mean temperature of 24.6°C, and an annual mean precipitation of 1,076.2 mm (Martínez and Galindo-Leal 2002).

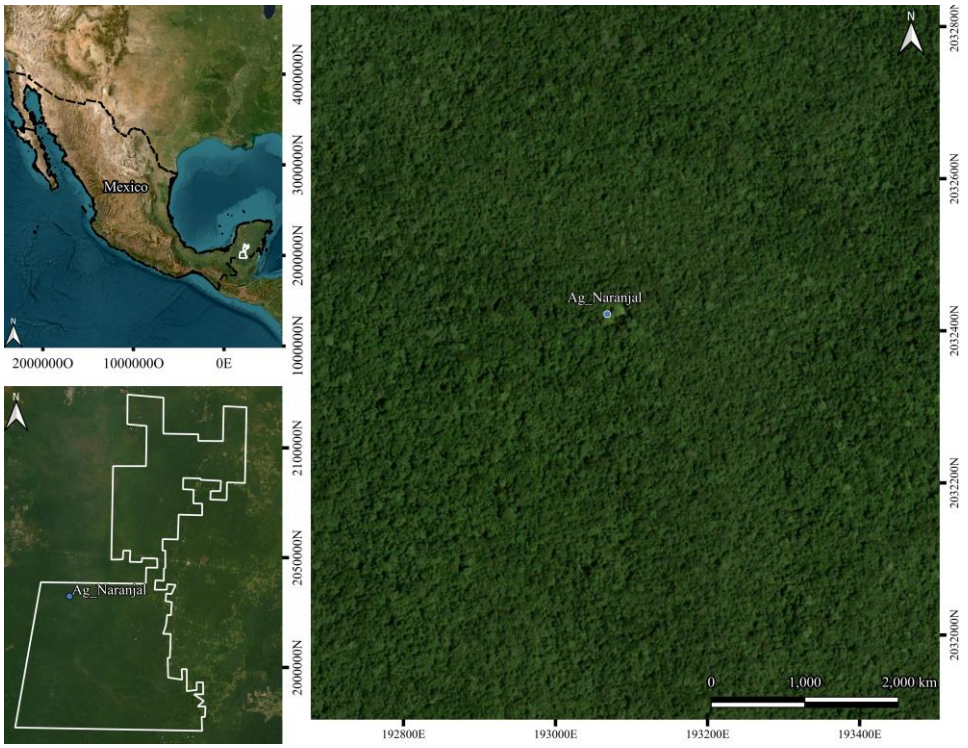

Figure 1. Calakmul Biosphere Reserve in Southern Mexico and *Naranjal aguada* and camera trap positions within it.

R. Reyna-Hurtado and collaborators have conducted a long-term study focused on wildlife uses of aguadas in the CBR using camera trapping survey since February 2014 to July 2023 in 18 ponds (Fig. 1). Usually, a single camera trap was installed in each pond of a set of 10 to 18 ponds that were monitored during these years, the main brands were Reconyx PC800 Hyperfire professional Reconyx, Inc., Cuddeback Inc and Browning Strike Force Co. Cameras were positioned 50 cm above the ground, and they were programmed to continuously take pictures every time the sensor detected movement and to have no delay time. The cameras were checked every other month to change batteries and memory cards.

From April 26 to May 13, 2024, one camera trap located in an *aguada* named *Naranjal*, recorded 97 videos of at least three tapir's individuals occurring in the pond and interacting in several ways. These 97 videos were carefully watched by three observers (authors), and we separately wrote our conclusions of what may have happened these days in the *aguada*. We looked for scars on the body of the interacting tapirs, for sex organs, and for any other mark that could possibly identify them with certainty. We also took into consideration the time when the individuals showed up, and the time when the interactions took place. Based on these observations and combining the exercise of the three authors, we describe the following events and, when possible, interpret them objectively.

Several vocalizations were recorded as well, so we described briefly the different sounds tapirs made during the survey. To do so, we used Raven Pro 1.6 to elaborate spectrograms and waveform graphics, to obtain basic measurements like duration of sound,

low frequency (Hz) and high frequency (Hz). We could not collect enough data to make a deeper sound analysis, so we compared our sounds with previous research from Gómez Hoyos et al. (2018). Of these individuals two are males and one is female, with the possibility of an additional female visiting the pond at the same time, but there was not enough evidence to differentiate both females. Late April and early May are the core of the dry season with temperatures that can reach up to 43° C in the CBR. The tapirs, as well as many wildlife species, seek refuge from heat in the *aguadas*. The following events happen in these days when the hot temperatures rose to their maximum.

Results

From April 26 to May 5th, two males and a female were observed visiting the pond at different times and the males sniffing several of the tree trunks around the *aguada*. On May 5th at night, the female is seeing with one of the males, however, next day the male is seeing alone and later that day the female is also alone, but she makes two large whistles with a duration of 1. 13 sec and 3.24 sec respectively. The lowest frequency of these sounds was 1009.2 Hz, and the highest frequency was 6105.5 Hz. Apparently, the female was on searching mode (Figs 2 and 3).

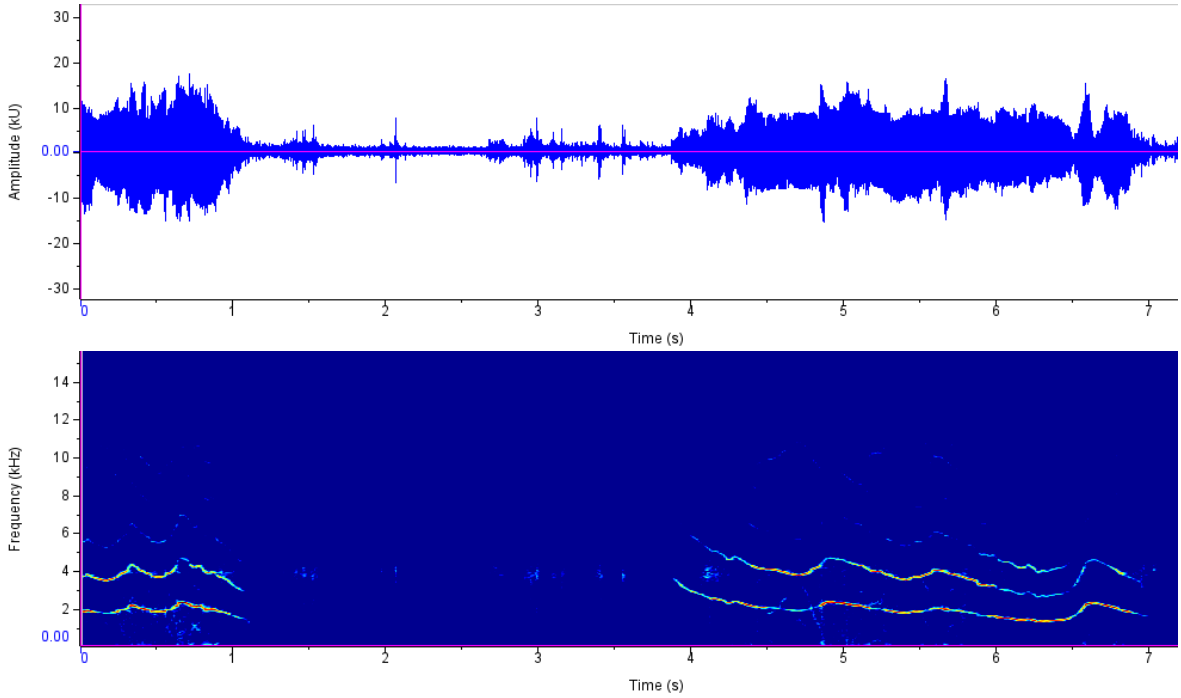

Figure 2. Amplitude (above) and frequency (below) of female Baird's tapir (*Tapirus bairdii*) whistles under searching behavior in an *aguada* of the Calakmul Biosphere Reserve, Southern Mexico.

Insert Video 138

Figure 3. Baird's tapir (*Tapirus bairdii*) female whistling under searching behavior in an *aguada* of the Calakmul Biosphere Reserve, Southern Mexico.

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From May5th to May 9th, two males are observed visiting the pond and one of them even marking the tree trunk with urine. The female is also observed these days although alone. On May 9th a fight that last for 4 hours at least is observed. Since 07:48 am to 11:16 am, ten videos showed up a couple of tapirs, one of them male for sure (although we suspect the other is also a male) are fighting and chasing each other in a very intense way, in the most violent fight (Fig. 4) the two tapirs are trying to reach the lower area of the hind legs of each other. Both individuals fall to the ground and stand up several times. The video also showed high turns where the animals bend their bodies in a surprising way given their heavy weight. After the fight, the two tapirs seem severely hurt, especially on the lower area of the back legs and in the back rump. One of them is limping.

Insert Video 174

Figure 4. Baird's tapir (*Tapirus bairdii*) adults fighting in an *aguada* of the Calakmul Biosphere Reserve, Southern Mexico.

On May 10, one of the tapirs is seen chasing another one from the *aguada* five times, always returning to the *aguada* one of them. In one of these chasing one of them emitted another set of short high pitch whistles with a mean duration of each whistle of 0.74 secs, and an average frequency that ranges from 1612.72 Hz to 5023.68 Hz (Figs 5 and 6), probably related to advertisement sounds.

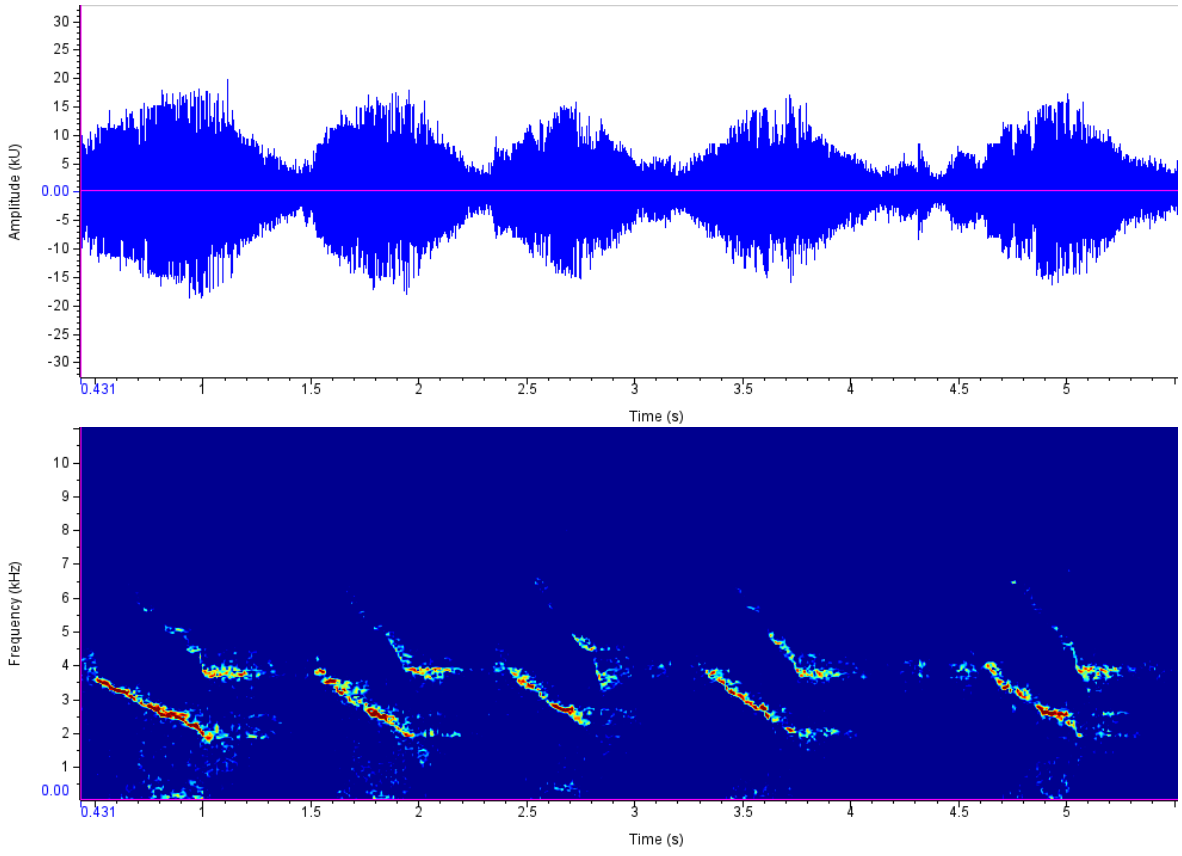

Figure 5. Amplitude (above) and frequency (below) of Baird's tapir (*Tapirus bairdii*) whistles under chasing behavior in an *aguada* of the Calakmul Biosphere Reserve, Southern Mexico.

Insert Video 188

Figure 6. Baird's tapir (*Tapirus bairdii*) males whistling under chasing behavior in an *aguada* of the Calakmul Biosphere Reserve, Southern Mexico.

On May 11th a female and a male are seeing together and following each other, the male also producing another set of short whistles while following closely (less than one meter) the female. On May 12, the male and the female are again seen alone, and the female have also some wounds on the left leg. On May 13th, during early hours of the morning (02:30 am) both individuals are seeing together and the male closely following the female and emitting the short whistle again, a similar sound to the one recorded on video 220. This whistle had a mean duration of 0.72 to 0.85 secs, with a mean low frequency ranging from 1234.6 Hz to 5521.02 Hz (Figs 7 and 8). This whistle is considered a sound related to courtship since the sound was made by the male walking after the female. On May 13th the camera stops recording due to the memory got full.

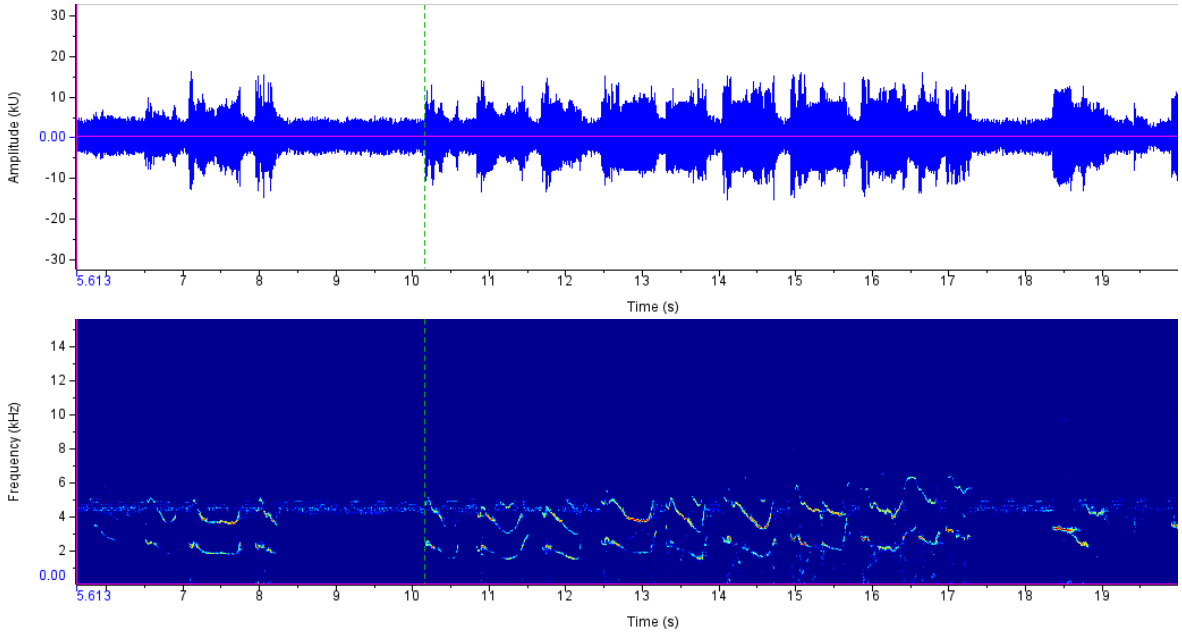

Figure 7. Amplitude (above) and frequency (below) of Baird's tapir (*Tapirus bairdii*) whistles under courtship behavior in an *aguada* of the Calakmul Biosphere Reserve, Southern Mexico.

Insert Video 240

Figure 8. Baird's tapir (*Tapirus bairdii*) males whistling when following a female in an *aguada* of the Calakmul Biosphere Reserve, Southern Mexico.

Discussion

Here we presented the most extreme set of fights we have observed among two adult tapirs that in a set of 97 videos describe how these fights are taking place and how they can inflict wounds in the individuals of the population of tapir. These fights can explain the set of wounds that several tapirs have in the back of the rump and in the lower back legs (Perez-Flores et al. 2022; R. Reyna-Hurtado unpublished information) The fights illustrate how the two individuals are looking to bite the other one in the back of their legs and how they protect from these bites by bending and moving constantly. It is also surprising to see how much the tapir body can bend and perform sharp turns when is being chase (or when chasing).

We also reported the behavioral dynamics that occurs around a female that probably is on estrus and when two males occurred at that time. We believed that the two fighting individuals are two males (although one of them never show up the sex organs) and that fight occurred after seeing two males showing up in the *aguada* at times probably looking for the female who also visited the *aguada* and is paired with one of them. So, we believe that this is a fight among two males for granting access to the female. That also correlate with the five times one of the male chase another individual the next day and always return to the pond. Also, one of the males is seeing with the female for some days after the fight. One fact that we cannot explain is the set of wound also that the female has in their left thigh. This female is the one paired with the male but on May 12 she is also seeing with several wounds in its leg. Was she involved in the fight against the other male? Was she the one fighting this male? Does the female fight with their partners before mate? These questions remain unanswered for now and we hope that the next set of photos will bring more information on the intense days before tapir form partners.

From the set of videos in which tapirs emitted the whistles we can conclude that they are performed in three different ways, one when one of them is searching for the other, other one is a courtship sound, since it's done when a male is following closely a female in a friendly way, this could be also part of their courtship as it was suggested by (Gomez-Hoyos et al. 2018), but we also found a different pitch that tapirs emitted when in stress situation (when one was chasing actively another one). This suggests that tapirs are more vocal than we know, and calls are part of their courtship, of their searching behavior and fighting (or fleeing) behavior (Gomez-Hoyos et al. 2018) and it has been also observed in the mountain tapir (*Tapirus pinchaque*; Rivera-Gomez et al. 2024).

Tapirs become involved in intense fighting that physically are extreme and that inflict several wounds on the involved individuals, these fights also included extreme chases cases and involve specific vocalizations. This means that tapir can be very aggressive with conspecifics, and several of the scars we may see, are due to these fights and not all of them are due to jaguar or pumas attempts to predation on them as it has been reported before (Meyer et al. 2022; Perez-Flores et al. 2022). This novel information on tapir fights and courtship behavior adds value to the versatile set of different behaviors that tapir can perform, from being gentle, passive animals that almost ignore people at times

(Reyna-Hurtado 2024) in the forests, to perform extreme fighting among conspecifics that include high jumping, high bends, marking of spots and performing specific vocalizations. In captivity, tapirs have shown aggressive behavior prior to copulation between male and female, if the female does not accept the male (Pukazhenti et al. 2013). Nevertheless, these behaviors are reported in artificial conditions, unlike in the wild where more than one male may be around a female. In the wild, these behaviors probably occur every time a female become in estrous and may last for some days even weeks. The fact that these behaviors were recorded in an *aguada* and previous information that showed up *aguadas* as being *social arenas* for tapir, highlight the conservation value that *aguadas* also play for tapirs, not only to just provide water to drink and refresh their bodies but to be as an encounter site for male and females.

Conclusions

There are many unanswered questions among tapir relationships with conspecifics, with other species, and with key parts of the landscape such as *aguadas*, we hope we can respond some of these in the future with the help of technology such as camera traps, audio boots or radiotelemetry, and we hope that the CBR remain unaltered and conserve the Neotropical species such as tapirs performing their hidden behaviors in *social arenas* and being a wild laboratory that allow us to observe these amazing natural behaviors of shy species like the tapir.

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Conflicts of Interest

“The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results”.

Author Contributions

Conceptualization, R. R. H.; methodology, R. R-H., J. O. H.-R. and E. R-F. S.; formal analysis, R. R-H., J. O. H.-R. and E. R-F. S, investigation, R. R. H.; resources, R. R. H.; writing—original draft preparation, R. R-H.; writing—review and editing, R. R-H., J. O. H-R. and E. R-F; project administration, R. R-H.; funding acquisition, R. R-H.; investigation, R. R-H., J. O. H-R., supervision, R. R-H. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

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