SOCIAL INTEGRATION OF LONE WILD HOWLER MONKEY (*ALOUATTA PALLIATA*) INTO A CAPTIVE-RAISED TROOP IN COSTA RICA

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Abstract

In Sarapiquí, Costa Rica, Toucan Rescue Ranch has started a rehabilitation program for orphaned golden-mantled howler monkeys (*Alouatta palliata*). These individuals are brought to the rescue center by the National Systems of Conservation Areas (SINAC), the government organization in charge of managing conservation areas in Costa Rica. The orphaned howler monkeys are received primarily due to electrocutions and are cared for by a team of trained biologists and veterinarians. Since the beginning of the program in 2021, seven individuals have been reintroduced at a release site. Post-release monitoring has been conducted in order to track their adaptation and survival in the wild. During routine observations, a lone wild male began to spend time near the reintroduced individuals. A series of interactions took place over the course of several weeks, culminating into the acceptance of the wild male by one of the reintroduced troops. This integration illustrates the potential for captive-raised individuals to form social bonds with wild counterparts, while highlighting the importance of monitoring behaviors during reintroduction efforts. By documenting these interactions, conservationists can gain valuable insights into how captive-raised individuals are adapting to wild habitats. Future research is critical in order to explore whether these connections can facilitate learning and ease the transition to a natural environment, ultimately contributing to more successful reintroduction outcomes.

Keywords: *Alouatta*, post-release monitoring, primate conservation, rehabilitation, reintroduction

Resumen

En Sarapiquí, Costa Rica, Toucan Rescue Ranch ha iniciado un programa de rehabilitación para monos aulladores (*Alouatta palliata*) huérfanos. Estos individuos son llevados al centro de rescate por el Sistema Nacional de Áreas de Conservación (SINAC), organismo gubernamental encargado de gestionar las áreas de conservación en Costa Rica. Los monos aulladores huérfanos son recibidos por diversos motivos y son atendidos por un equipo de biólogos y veterinarios capacitados. Desde el inicio del programa en 2021, se han reintroducido siete individuos en un sitio de liberación. Se ha realizado un seguimiento posterior a la liberación para rastrear su adaptación y supervivencia en la naturaleza. Durante las observaciones de rutina, un macho salvaje solitario comenzó a pasar tiempo cerca de los individuos reintroducidos. A lo largo de varias semanas pasó una serie de interacciones que culminaron con la aceptación del macho salvaje por parte de una de las tropas reintroducidas. Esta integración ilustra el potencial de los individuos criados en cautiverio para formar relaciones sociales con sus homólogos salvajes, al mismo tiempo que resalta la importancia de monitorear los comportamientos durante los esfuerzos de reintroducción. Al documentar estas interacciones, los conservacionistas pueden obtener información valiosa sobre cómo los individuos criados en cautiverio se están adaptando a los hábitats salvajes. La investigación futura es fundamental para explorar si estas conexiones pueden facilitar el aprendizaje y facilitar la transición a un hábitat natural, contribuyendo en última instancia a resultados de reintroducción más exitosos.

Palabras clave: *Alouatta*, conservación de primates, monitoreo posterior a la liberación, rehabilitación, reintroducción

Introduction

Documentation of the outcomes of primate rehabilitation efforts is limited within the existing literature (Guy et al., 2013). For example, Guy et al. (2015) found low survival rates in vervet monkey releases and poor adherence to IUCN guidelines, highlighting challenges in rehabilitation efforts. Similarly, Cheyne (2009) emphasizes the importance of long-term monitoring and standardized procedures to improve the chances of success. Despite these insights, many projects lack adequate post-release monitoring, leaving gaps in understanding rehabilitation effectiveness (Speiran et al., 2023). Many rehabilitation projects do not monitor post-release outcomes or do it for insufficient amounts of time, leading to significant gaps in our understanding of the effectiveness of these initiatives (Speiran et al., 2023). Researchers often debate the definition of success in these rehabilitation efforts, leading to difficulties when comparing reintroduction programs (Speiran et al., 2023). Short-term success for wildlife is typically measured by the self-sufficiency of individuals post-release (Griffith et al., 1989), while long-term indicators commonly include successful reproduction of viable offspring, integration with wild conspecifics, and survival without human intervention (Beck, 2018).

While several studies have documented the release of primates in areas with existing conspecifics (Vogel et al., 2002; de Palomino, 2013), there is often a lack of information regarding the interactions between released individuals and their wild counterparts. Howler monkeys (*Alouatta* spp.) have been the focus of various translocation studies (Ostro et al., 1999; Richard-Hansen, 2000; Shedden-Gonzalez, 2010; Tricone, 2017). However, there

is a lack of focused investigations addressing the integration process of rehabilitated individuals with wild conspecifics. In a study by Brockett (2000), two wild-born, captive-raised black howlers in Belize (*Alouatta pigra*) were released and later observed alongside three other individuals; however, no specific observations were made regarding their group formation.

In our study, we report on the immigration of a wild-born male golden-mantled howler monkey (*Alouatta palliata*) into a troop of three captive-raised individuals as a benchmark of success for our reintroduction program in Sarapiquí, Costa Rica.

Methods

In 2021, prompted by a rise in electrocution incidents in the area, Toucan Rescue Ranch began its efforts to rescue howler monkeys at a release site in Sarapiquí, Costa Rica (Fig. 1). Most of the individuals were orphaned due to their mothers succumbing to electrocution injuries. Two howler monkeys were released in 2023, and five more in 2024. One of the five from the second troop (Troop 2) joined the first two individuals, and this is the troop we focus on in our study (Troop 1).

We collected *ad libitum* behavioral data on Troop 1 from October 10, 2023, to May 31, 2024, allowing us to capture spontaneous behaviors and interactions that occurred with the wild male. The troop consisted of three sub-adult males, each estimated to be around 2 years old at the time of release. We identified the monkeys based on their genitals, distinct pigmentations, and the facial characteristics we became familiar with during their rehabilitation. One lone wild male, frequently seen in the trees bordering the Release Site since 2021, was referred to by researchers as Pata Rosada, named for the unique pink markings on the pads of his back feet.

Results

The initial interaction between the lone wild male and the rehabilitated individuals was recorded on April 26th, 2024. All individuals from Troop 1 were resting in a beach almond tree, and the lone wild male (Pata Rosada) appeared in a nearby tree and attempted to approach them. Two of the males and Pata Rosada maintained consistent eye contact while intermittently vocalizing for several minutes. The vocalizations included howling and a mixture of soft grunting noises. During this period, the youngest male emitted sounds resembling the cries of infant howlers. Subsequently, the lone male engaged

Figure 1. Map showing Toucan Rescue Ranch and the release site of Troop 1 and 2. Map created in ArcMap 10.8.2.

in a tongue-flicking behavior directed towards them, prompting all four monkeys to move in a parallel manner, neither advancing or retreating from one another. After a few minutes, the three individuals from Troop 1 began moving towards Pata Rosada, resulting in his retreat through the canopy.

On April 29th, Pata Rosada was observed with a female from Troop 2. At the same time one of the juvenile males from Troop 1 was observed running nearby along the ground. Upon scanning the trees above him, we observed Pata Rosada less than one meter away from the female. After several seconds of observation, he proceeded to tongue-flick in her direction. The captive-raised female permitted him to approach, prompting soft grunting sounds, which escalated into a frantic embrace between the two. At that moment, one of the other juveniles from Troop 1 ran to their companion on the ground. Upon noticing both males fleeing, the female quickly retreated from the lone male and followed Troop 1 males. Pata Rosada pursued the trio for approximately ten minutes, both in the trees and on the ground before losing track of them.

On April 30th, Pata Rosada displayed rapid tongue movements toward one of the reintroduced Troop 1 males, eventually approaching him. This interaction culminated in an embrace similar to that previously observed with the female, followed by anogenital sniffing.

On May 1st, Troop 1 was observed foraging and resting, with the three males a few meters apart from each other and continuously vocalizing. Pata Rosada maintained a distance of 5 to 10 meters behind them, positioning himself below the canopy. When any of the three vocalized loudly, he would increase the distance accordingly. About an hour into the observation, an undetermined negative interaction took place when Pata Rosada was in close proximity to one individual; however, we were unable to identify which one due to the dense foliage. This interaction was marked by loud scuffle sounds, prompting the three males to flee the location swiftly. Pata Rosada followed at a greater distance than before, not matching their speed. Ten minutes later, having lost sight of them completely, he began to vocalize softly, producing a sound that combined elements of a soft howl and the infantile vocalizations previously exhibited by the youngest male on April 26th.

The next sighting occurred on May 8th, when Troop 1 and the lone wild male were observed resting and foraging within five meters of one another. They stayed together for the entirety of the four-hour observation period. During the remainder of the data collection period, which concluded on May 31st, it was more common than not to observe the individuals functioning as a cohesive group, foraging and moving together.

Discussion

Our observations provide valuable insights into the specific behaviors that facilitate social bonds, particularly between rehabilitated individuals and wild conspecifics. Natal dispersal is a common occurrence among juvenile golden-mantled howler monkeys (*Alouatta palliata*), with reports indicating that nearly 80% of males leave their natal troops and may remain solitary for up to four years before joining another group (Glander, 1992). As seen in our study, male golden-mantled howler monkeys typically integrate into established groups by trailing their chosen troop and gradually reducing the distance between them (Glander, 1992). Upon meeting, howlers engage in a behavior known as the "greeting ceremony," characterized by a tight embrace that lasts several seconds (Glander, 1980). This interaction often includes soft grumbling vocalizations and sniffing of armpits and/or genitalia (Wang and Milton, 2003). Howler monkeys over two years old are known to only engage in ceremonies with males under two, avoiding interactions with peers of their own age or older (Glander, 1980).

Our observations are consistent with previous research on all except two counts: 1) The "tongue flicking" display is predominantly associated with sexual behavior in *Alouatta palliata* (Jones, 1985), making it notable that the lone male utilized this behavior to gain acceptance within the all-male group, 2) The "greeting ceremony" in our study also occurred between the lone male and a female howler. This is notable because previous studies state that participants of this behavior were always of the same sex (Glander, 1980).

During their solitary phase, males often focus on growing larger and stronger in preparation for confronting the alpha male of a troop, which is essential for gaining acceptance (Glander, 1992). Solitary males may opt to collaborate with other individuals rather than join an established group (Glander, 1992). Collective actions such as predator vigilance and alarm calling can also provide better protection from potential threats (Garber and Kowalewski, 2011). This could be an explanation for why the lone howler in our study chose to integrate with the other three individuals, seeking a strategic alliance rather than facing the challenges of solitary life. Research on lone male howlers indicates that these individuals tend to utilize smaller trees with lower-quality food resources for feeding and resting, likely as a competition avoidance strategy (Bolt, 2021). Belonging to a small group may signal to other groups that the individual is part of a cohesive unit, which could deter confrontations and increase the likelihood of the small group accessing better resources together. Consequently, lone male howler monkeys can boost their overall fitness by forming alliances with other males, leveraging social bonds to improve access to resources and reduce competition.

A study on *Alouatta pigra* found that two males formed coalitions and successfully took over another group by evicting resident males, suggesting a potential strategy for taking over another troop (Van Belle, 2012). It would be interesting to investigate whether this tactic becomes a future survival strategy for the four males in our study.

Interactions between wild-born and captive-raised individuals of other primates have been reported, but there are few published reports on the details of these integrations. The successful integration of captive-raised individuals with wild counterparts is regarded as a key indicator of success for rehabilitation programs (Beck, 2018). Post-release monitoring of spider monkeys (*Ateles* spp.) revealed that some groups benefited from interactions with established groups, particularly during foraging activities (Pottie, 2021). It is very possible that recently released primates may benefit from these social learning opportunities and integration with wild individuals may reduce the stress of navigating a new environment.

To our knowledge, this is the first comprehensive report on rehabilitated howler monkeys successfully integrating with wild conspecifics. This marks a significant milestone in reintroduction efforts for these primates, not only contributing to our understanding of the social dynamics and behaviors involved but also underscoring the potential for captive-raised individuals to enhance their fitness through strategic alliances. Further research is essential to monitor the long-term outcomes of this integration, assess its effects on the behavior of both the solitary male and the captive-raised juveniles, and explore the broader implications for rehabilitation programs aimed at promoting successful reintegration into wild populations.

Acknowledgments

We thank the director and staff at Toucan Rescue Ranch for support during this project and for their continued dedication and contribution to the conservation of the wildlife of Costa Rica.

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